



**BID DOCUMENTS & GENERAL CONDITIONS
FOR
GYMNASIUM HVAC REPLACEMENT FOR
SAN DIMAS HIGH SCHOOL AND BONITA HIGH SCHOOL**

Bid No. 22-23:11

Bids are due by 1:00 P.M. on February 9, 2023

115 W. Allen Avenue, San Dimas, Ca 91773 (909) 971-8200

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NOTICE INVITING BIDS
BONITA UNIFIED SCHOOL DISTRICT

NOTICE IS HEREBY GIVEN that the Bonita Unified School District of Los Angeles County, California, acting by and through its Governing Board, hereinafter referred to as the “District”, will receive sealed bids at the Receptionist Desk of the District at 115 West Allen Avenue, San Dimas, CA 91773 and will be publicly opened and read aloud on the date and time specified below:

<u>Project Identification Name</u>	<u>Mandatory Job Walks</u>	<u>Opening Date/Time</u>
Bid: 22-23:11	January 25, 2023 1:00 P.M.	February 9, 2023 1:00 P.M.
(2) Gymnasium HVAC Replacement	San Dimas High School 800 W Covina Blvd. San Dimas, CA 91773	Facilities Department 115 W Allen Avenue San Dimas, CA 91773
Immediately followed at: Bonita High School 3102 D Street La Verne, CA 91750		

Contractor shall possess at the time of bid a valid State Contractors License – B General Contractor

This Project is being let in accordance with the informal bid requirements of the California Uniform Public Construction Cost Accounting Act (“CUPCCAA”) set forth in Public Contract Code section 22000 et seq. (specifically, the informal bidding procedures in Section 22032(b)). Bidders shall comply with any requirements set forth in the CUPCCAA including all guidelines and requirements in the current California Uniform Public Construction Cost Accounting Commission Cost Accounting Policies and Procedures Manual. All contractors submitting bids must be on the District’s current list of approved contractors pursuant to Public Contract Code section 22034.

There will be a mandatory job walk for each bid at the location and time listed above. Bid documents can be downloaded from the District’s website at: <https://do.bonita.k12.ca.us/District/Business-Services/Purchasing/index.html>. Any Contractor bidding on the Project who fails to attend the entire mandatory job walks and conference will be deemed a non-responsive bidder and will have its bid returned unopened.

Contractors and Subcontractors must be registered with DIR and in compliance with SB854 to submit a bid for evaluation.

Sealed bids shall be made and presented only on the District forms. Sealed bids will be received ***no later than the bid opening time listed above*** and shall be opened and publicly read aloud at the Facilities Department Conference Room at the designated time listed above. It is each bidder’s sole responsibility to ensure its bid is timely delivered and received at the location designated as specified above. Any bid received at the designated location after the scheduled closing time for receipt of bids shall be returned to the bidder unopened.

Each bid must strictly conform with and be responsive to the contract documents as defined in the General Conditions.

No bidder may withdraw a submitted bid for a period of sixty (60) days after the time set for opening bids.

The District and Board of Education reserve the right to reject all bids and to waive any irregularities or informalities in any bid or in the bidding procedure.

**Board of Education
Bonita Unified School District
County of Los Angeles, California
Shamica R. Nance
Director, Purchasing/Warehouse**

Publishing Dates: Jan 10 & 17, 2023

Miscellaneous Information

All bids shall be made and presented only on the forms presented by the District. Bids shall be received at the receptionist's desk of the District Office at 115 W. Allen Avenue, San Dimas, CA 91773 by 3:00 P.M. on February 8, 2023 and shall be opened and publicly read aloud at the above state time and place. Any bids received after the time specified above or after any extensions due to material changes shall be returned unopened.

Contractor should consult the General Conditions, Supplementary Conditions, and General Requirements regarding Milestones and Liquidated Damages. The bid documents are available at: <https://do.bonita.k12.ca.us/District/Business-Services/Purchasing/index.html>

There will be a mandatory job walk at 1:00 P.M. on January 25, 2023 at San Dimas High School, 800 W Covina Blvd., San Dimas, CA 91773 immediately following Bonita High School, 3102 D Street, La Verne, CA 91750. Any Contractor bidding on the Project who fails to attend the entire mandatory job walk will be deemed a non-responsive bidder and will have its bid returned unopened.

Each bidder shall be a licensed Contractor pursuant to the California Business and Professions Code, and be licensed to perform the work called for in the Contract Documents. The successful bidder must possess a valid and active Class **<B- General Contractor>** License at the time of bid and throughout the duration of this Contract. The Contractor's California State License number shall be clearly stated on the bidder's proposal.

According to Public Contract Code 20111.5, each bidder shall be registered and listed on the Quality Bidders list prior to submittal of a bid.

Subcontractors shall be licensed pursuant to California law for the trades necessary to perform the Work called for in the Contract Documents.

Each bid must strictly conform with and be responsive to the Contract Documents as defined in the General Conditions.

The District reserves the right to reject any or all bids or to waive any irregularities or informalities in any bids or in the bidding.

Each bidder shall submit with its bid — on the form furnished with the Contract Documents — a list of the designated subcontractors on this Project as required by the Subletting and Subcontracting Fair Practices Act, California Public Contract Code section 4100 et seq.

In accordance with California Public Contract Code section 22300, the District will permit the substitution of securities for any moneys withheld by the District to ensure performance under the Contract. At the request and expense of the Contractor, securities equivalent to the amount withheld shall be deposited with the District, or with a state or federally chartered bank as the escrow agent, who shall then pay such moneys to the Contractor. Upon satisfactory completion of the Contract, the securities shall be returned to the Contractor.

Each bidder's bid must be accompanied by one of the following forms of bidder's security: (1) a cashier's check made payable to the District; (2) a certified check made payable to the District; or (3) a bidder's bond executed by a California admitted surety as defined in Code of Civil Procedure section 995.120, made payable to the District in the form set forth in the Contract Documents. Such bidder's security must be in

an amount not less than ten percent (10%) of the maximum amount of bid as a guarantee that the bidder will enter into the proposed Contract, if the same is awarded to such bidder, and will provide the required Performance and Payment Bonds, insurance certificates and any other required documents. In the event of failure to enter into said Contract or provide the necessary documents, said security will be forfeited.

The Contractor and all subcontractors shall comply with the requirements set forth in Division 2, Part 7, Chapter 1 of the Labor Code. The District has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this work is to be performed for each craft, classification or type of worker needed to execute the Contract. These per diem rates, including holiday and overtime work, as well as employer payments for health and welfare, pension, vacation, and similar purposes, are on file at the District, and are also available from the Director of the Department of Industrial Relations. Pursuant to California Labor Code section 1720 et seq., it shall be mandatory upon the Contractor to whom the Contract is awarded, and upon any subcontractor under such Contractor, to pay not less than the said specified rates to all workers employed by them in the execution of the Contract.

A Contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in the Labor Code, unless currently registered and qualified to perform public work pursuant to Labor Code section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the Contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

The Contractor and all subcontractors shall furnish certified payroll records as required pursuant Labor Code section 1776 directly to the Labor Commissioner in accordance with Labor Code section 1771.4 on at least on a monthly basis (or more frequently if required by the District or the Labor Commissioner) and in a format prescribed by the Labor Commissioner. Monitoring and enforcement of the prevailing wage laws and related requirements will be performed by the Labor Commissioner/ Department of Labor Standards Enforcement (DLSE).

No bidder may withdraw any bid for a period of ninety (90) calendar days after the date set for the opening of bids.

Separate payment and performance bonds, each in an amount equal to 100% of the total Contract amount, are required, and shall be provided to the District prior to execution of the Contract and shall be in the form set forth in the Contract Documents.

All bonds (Bid, Performance, and Payment) must be issued by a California admitted surety as defined in California Code of Civil Procedure section 995.120.

Where applicable, bidders must meet the requirements set forth in Public Contract Code section 10115 et seq., Military and Veterans Code section 999 et seq. and California Code of Regulations, Title 2, Section 1896.60 et seq. regarding Disabled Veteran Business Enterprise ("DVBE") Programs. Forms are included in this Bid Package.

Any request for substitutions pursuant to Public Contract Code section 3400 must be made at the time of Bid on the Substitution Request Form set forth in the Contract Documents and included with the bid.

No telephone or facsimile machine will be available to bidders on the District premises at any time.

It is each bidder's sole responsibility to ensure its bid is timely delivered and received at the location designated as specified above. Any bid received at the designated location after the scheduled closing time for receipt of bids shall be returned to the bidder unopened.

BONITA UNIFIED SCHOOL DISTRICT

INSTRUCTIONS TO BIDDERS

1. **Preparation of Bid Form.** Proposals under these specifications shall be submitted on the blank forms furnished herewith at the time and place stated in the Notice Inviting Bids. All blanks in the bid form must be appropriately filled in, and all proposed prices must be stated clearly and legibly in both words and numerals. All bids must be signed by the bidder in permanent blue ink and submitted in sealed envelopes, bearing on the outside, the bidder's name, address, telephone number, and California Contractor's License number, and the name of the Project for which the bid is submitted. The District reserves the right to reject any bid if all of the above information is not furnished. It is each bidder's sole responsibility to ensure its bid is timely delivered and received at the location designated as specified above. Any bid received at the designated location after the scheduled closing time for receipt of bids shall be returned to the bidder unopened.
2. **Bid Security.** Each bid must be accompanied by one of the following forms of bidder's security: (1) a cashier's check made payable to the District; (2) a certified check made payable to the District; or (3) a bidder's bond executed by a California admitted surety as defined in Code of Civil Procedure section 995.120, made payable to the District, in the form set forth in the Contract Documents. Such bidder's security must be in an amount not less than ten percent (10%) of the maximum amount of such bidder's bid as a guarantee that the bidder will enter into the Contract, if the same is awarded to such bidder, and will provide the required Performance and Payment Bonds, insurance certificates and any other required documents. In the event that a bidder is awarded the Contract and such bidder fails to enter into said Contract or provide the surety bond or bonds within five (5) calendar days after award of the Contract to bidder, said security will be forfeited.
3. **Signature.** The bid form, all bonds, all designations of subcontractors, the Contractor's Certificate, the Agreement, and all Guarantees must be signed in permanent blue ink in the name of the bidder and must bear the signature in longhand of the person or persons duly authorized to sign the bid.

If bidder is a corporation, the legal name of the corporation shall first be set forth, together with two signatures: one from the President and one from the Secretary or Assistant Secretary. Alternatively, the signature of other authorized officers or agents may be affixed, if a certified copy of the resolution of the corporate board of directors authorizing them to do so is provided to the District. Such documents shall include the title of such signatories below the signature and shall bear the corporate seal.

If bidder is a partnership, the true name of the firm shall first be set forth, together with the names of all persons comprising the partnership or co-partnership. The bid must be signed by all partners comprising the partnership unless proof in the form of a certified copy of a statement of partnership acknowledging the signer to be a general partner is presented to the District, in which case the general partner may sign.

Bids submitted as joint ventures must so state and be signed by each joint venturer.

Bids submitted by individuals must be signed by the bidder unless an up to date power- of-attorney is on file in the District office, in which case, said person may sign for the individual.

The above rules also apply in the case of the use of a fictitious firm name. In addition, however, where a fictitious name is used, it must be so indicated in the signature.

4. Modifications. Changes in or additions to the bid form, recapitulations of the work bid upon, alternative proposals, or any other modification of the bid form which is not specifically called for in the Contract Documents may result in the District's rejection of the bid as not being responsive to the Notice Inviting Bids. **No oral or telephonic modification of any bid submitted will be considered.**
5. Erasures, Inconsistent or Illegible Bids. The bid submitted must not contain any erasures, interlineations, or other corrections unless each such correction creates no inconsistency and is suitably authenticated by affixing in the margin immediately opposite the correction the signature or signatures of the person or persons signing the bid. In the event of inconsistency between words and figures in the bid price, words shall control figures. In the event that the District determines that any bid is unintelligible, inconsistent, or ambiguous, the District may reject such bid as not being responsive to the Notice Inviting Bids.
6. Examination of Site and Contract Documents. Each bidder shall visit the site of the proposed work and become fully acquainted with the conditions relating to the construction and labor so that the facilities, difficulties, and restrictions attending the execution of the work under the Contract are fully understood. Bidders shall thoroughly examine and be familiar with the drawings and specifications and all other documents and requirements that are attached to and/or contained in the Project Manual or other documents issued to bidders. The failure or omission of any bidder to receive or examine any Contract Documents, form, instrument, addendum, or other document or to visit the site and become acquainted with conditions there existing shall not relieve any bidder from obligations with respect to the bid or to the contract. The submission of a bid shall be taken as prima facie evidence of compliance with this Section. Bidders shall not, at any time after submission of the bid, dispute, complain, or assert that there were any misunderstandings with regard to the nature or amount of work to be done.
7. Withdrawal of Bids. Any bid may be withdrawn, either personally or by written request, at any time prior to the scheduled closing time for receipt of bids. The bid security for bids withdrawn prior to the scheduled closing time for receipt of bids, in accordance with this paragraph, shall be returned upon demand therefor.

No bidder may withdraw any bid for a period of ninety (90) calendar days after the date set for the opening of bids.

8. Agreements, Insurance and Bonds. The Agreement form which the successful bidder, as Contractor, will be required to execute, and the forms and amounts of surety bonds and insurance endorsements which Contractor will be required to be furnished at the time of execution of the Agreement, are included in the bid documents and should be carefully examined by the bidder. The number of executed copies of the Agreement, the Performance Bond, and the Payment Bond required is two (2). Payment and Performance bonds must be executed by an admitted surety insurer as defined in Code of Civil Procedure 995.120.
9. Interpretation of Plans and Documents/Pre-Bid Clarification. If any prospective bidder is in doubt as to the true meaning of any part of the Contract Documents, or finds discrepancies in, or omissions, a written request for an interpretation or correction thereof may be submitted to the District. The bidder submitting the request shall be responsible for its prompt delivery. Any interpretation or correction of the Contract Documents will only be made by Addendum duly issued, and a copy of such Addendum will be made available for each Contractor receiving a set of the Contract Documents. No person is authorized to make any oral interpretation of any provision in the Contract Documents, nor shall any oral interpretation be binding on the District. If discrepancies on drawings, specifications or elsewhere in the Contract Documents are not covered by addenda, bidder shall include in their bid

methods of construction and materials for the higher quality and complete assembly. Each request for clarification shall be submitted in writing, via email, to only the following persons:

TO: Shamica Nance, Director of Purchasing - snance@bonita.k12.ca.us

Each transmitted request shall contain the name of the person and/or firm filing the request, address, telephone, and fax number, Specifications and/or Drawing number. Bidder is responsible for the legibility of hand-written requests. Pre-bid clarification request shall be filed a minimum of **six (6)** days prior to bid opening. Requests received less than **six (6)** days before bid opening shall not be considered or responded to. A written response to timely pre-bid clarifications requests which materially affects the bidders price will be made by Addendum issued by the District not less than seventy-two (72) hours prior to bid opening.

10. Bidders Interested in More Than One Bid. No person, firm, or corporation shall be allowed to make, or file, or be interested in more than one prime bid for the same work unless alternate bids are specifically called for. A person, firm, or corporation that has submitted a proposal to a bidder, or that has quoted prices of materials to a bidder, is not thereby disqualified from submitting a proposal or quoting prices to other bidders or making a prime proposal.
11. Award of Contract. The Contract will be awarded to the lowest responsive responsible bidder by action of the governing Board. The District reserves the right to reject any or all bids, or to waive any irregularities or informalities in any bids or in the bidding. In the event an award is made to bidder, and such bidder fails or refuses to execute the Contract and provide the required documents within five (5) calendar days after award of the Contract to bidder, the District may award the Contract to the next lowest responsible and responsive bidder or release all bidders. **Each bid must conform and be responsive to the Contract Documents as defined in the General Conditions.**
12. Bid Protest Procedure. Any bidder may file a bid protest. The protest shall be filed in writing with the District's Director of Purchasing not more than five (5) business days after the date of the bid opening. An e-mail address shall be provided and by filing the protest, protesting bidder consents to receipt of e-mail notices for purposes of the protest and protest related questions and protest appeal, if applicable. The protest shall specify the reasons and facts upon which the protest is based.
 - a. Resolution of Bid Controversy: Once the bid protest is received, the apparent lowest responsible bidder will be notified of the protest and the evidence presented. If appropriate, the apparent low bidder will be given an opportunity to rebut the evidence and present evidence that the apparent low bidder should be allowed to perform the Work. If deemed appropriate by the District, an informal hearing will be held. District will issue a written decision within fifteen (15) calendar days of receipt of the protest, unless factors beyond the District's reasonable control prevent such resolution. The decision on the bid protest will be copied to all parties involved in the protest.
 - b. Appeal: If the protesting bidder or the apparent low bidder is not satisfied with the decision, the matter may be appealed to the Assistant Superintendent of Business Services, or his or her designee, within three (3) business days after receipt of the District's written decision on the bid protest. The appeal must be in writing and sent via overnight registered mail with all accompanying information relied upon for the appeal and an e-mail address from which questions and responses may be provided to:

Bonita Unified School District
Attn: Assistant Supt. of Business Services
115 W. Allen Avenue
San Dimas, CA 91773

- c. Appeal Review: The Assistant Superintendent of Business Services or his or her designee shall review the decision on the bid protest from the Director of Purchasing and issue a written response to the appeal, or if appropriate, appoint a Hearing Office to conduct a hearing and issue a written decision. The written decision of the Assistant Superintendent of Business Services or the Hearing Officer shall be rendered within fifteen (15) calendar days and shall state the basis for the decision. The decision concerning the appeal will be final and not subject to any further appeals.
 - d. Reservation of Rights to Proceed with Project Pending Appeal. The District reserves the right to proceed to award the Project and commence construction pending an Appeal. If there is State Funding or a critical completion deadline, the District may choose to shorten the time limits set forth in this Section if written notice is provided to the protesting party. E-mailed notice with a written confirmation sent by First Class Mail shall be sufficient to constitute written notice. If there is no written response to a written notice shortening time, the District may proceed with the award.
 - e. Finality. Failure to comply with this Bid Protest Procedure shall constitute a waiver of the right to protest and shall constitute a failure to exhaust the protesting bidder's administrative remedies.
13. Alternates. If alternate bids are called for, the Contract may be awarded at the election of the Governing Board to the lowest responsible and responsive bidder using the method and procedures outlined in the Notice Inviting Bids and as specified in the section entitled Alternate/Deductive Bid Alternates.
- a. Subcontractor Listing for Alternates. If alternate bids are called for and the bidder intends to use different or additional subcontractors, a separate list of subcontractors must be submitted for each such alternate.
14. Evidence of Responsibility. Upon the request of the District, a bidder whose bid is under consideration for the award of the Contract shall submit promptly to the District satisfactory evidence showing the bidder's financial resources, surety and insurance claims experience, construction experience, completion ability, workload, organization available for the performance of the Contract, and other factors pertinent to a Project of the scope and complexity involved.
15. Listing Subcontractors. Each bidder shall submit with his bid, on the form furnished with the Contract Documents, a list of the names, license numbers, scopes of work, locations of the places of business, contact information, and Department of Industrial Relations ("DIR") registration numbers of each subcontractor who will perform work or labor or render service to the bidder in or about the project, or a subcontractor who under subcontract to the bidder, specially fabricates and installs a portion of the work, in an amount in excess of one-half of 1 percent of the bidder's total bid as required by the Subletting and Subcontracting Fair Practices Act (Public Contract Code section 4100, et seq.) Pursuant to Labor Code section 1725.5, all subcontractors (of any tier) performing work on this Project must be properly registered with DIR.

16. Workers' Compensation. In accordance with the provisions of Labor Code section 3700, the successful bidder as the Contractor shall secure payment of compensation to all employees. The Contractor shall sign and file with the District the following certificate prior to performing the work under this contract: "I am aware of the provisions of Section 3700 of the Labor Code, which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract." The form of such certificate is included as a part of the Bid Documents.
17. Contractor's License. To perform the work required by this notice, the Contractor must possess the Contractor's License as specified in the Notice Inviting Bids, and the Contractor must maintain the license throughout the duration of the contract. If, at the time of bid, bidder is not licensed to perform the Project in accordance with Division 3, Chapter 9, of the Business and Professions Code for the State of California and the Notice to Contractors calling for bids, such bid will not be considered and the Contractor will forfeit its bid security to the District.
18. Anti-Discrimination. It is the policy of the District that in connection with all work performed under contracts, there be no discrimination against any prospective or active employee engaged in the work because of race, color, ancestry, national origin, religious creed, sex, age, or marital status. The Contractor agrees to comply with applicable federal and California laws, including, but not limited to, the California Fair Employment and Housing Act, beginning with Government Code section 12900 and Labor Code section 1735. In addition, the Contractor agrees to require like compliance by any subcontractors employed on the work by such Contractor.
19. Preference for Materials and Substitutions.
 - a. One Product Specified. Unless the Plans and Specifications state that no Substitution is permitted, whenever the Contract Documents indicate any specific article, device, equipment, product, material, fixture, patented process, form, method, construction, or any specific name, make, trade name, or catalog number, with or without the words, "or equal," such specification shall be read as if the language "or equal" is incorporated.
 - b. Request for Substitution. Bidder may, unless otherwise stated, offer any material, process, article, etc., which is materially equal or better in every respect to that so indicated or specified ("Specified Item") and will completely accomplish the purpose of the Contract Document. If bidder desires to offer a Substitution for a Specified Item, such bidder must make a request in writing on the District's Substitution Request Form ("Request Form") and submit the completed Request Form with the bidder's bid. The Request Form must be accompanied by evidence as to whether the proposed substitution:
 - 1) Is equal in quality, service, and ability to the Specified Item as demonstrated by a side by side comparison of key characteristics and performance criteria (CSI comparison chart);
 - 2) Will entail no changes in detail, construction and scheduling of related work;
 - 3) Will be acceptable in consideration of the required design and artistic effect;
 - 4) Will provide no cost disadvantage to the District;
 - 5) Will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts; and
 - 6) Will require no change in the Contract Time.

In completing the Request Form, bidder must state with respect to each requested substitution whether bidder will agree to provide the Specified Item in the event that the District denies bidder's request for substitution of a Specified Item. In the event that bidder does not agree in the Request Form to provide the Specified Item and the District denies the requested Substitution, the bidder's bid shall be considered non-responsive and the District may award the Contract to the next lowest bidder or in its sole discretion, release all bidders. In the event that bidder has agreed in the Request Form to provide the Specified Item and the District denies bidder's requested substitution for a Specified Item, bidder shall execute the Agreement and provide the Specified Item without any additional cost or charge to the District, and if bidder fails to execute the Agreement with the Specified Item(s), bidder's bid bond will be forfeited.

After the bids are opened, the apparent lowest bidder shall provide, within five (5) calendar days of opening such bids, any and all Drawings, Specifications, samples, performance data, calculations, and other information as may be required to assist the Architect and the District in determining whether the proposed substitution is acceptable. The burden of establishing these facts shall be upon the bidder.

After the District's receipt of such evidence by bidder, the District will make its final decision as to whether the bidder's request for Substitution for any Specified Items will be granted. The District shall have sole discretion in deciding as to whether a proposed request for Substitution is equal to or better than a Specified Item. Any request for Substitution which is granted by the District shall be documented and processed through a Change Order. The District may condition its approval of any Substitution upon delivery to the District of an extended warranty or other assurances of adequate performance of the Substitution. Any and all risks of delay due to DSA, or any other governmental agency having jurisdiction shall be on the bidder.

20. Disqualification of Bidders and Proposals. More than one proposal for the same work from any individual, firm, partnership, corporation, or association under the same or different names will not be accepted; and reasonable grounds for believing that any bidder is interested in more than one proposal for the work will be cause for rejecting all proposals in which such bidder is interested and the bidder will forfeit their bid security to the District.
21. Unbalanced or Altered Bids. Proposals in which the prices are obviously unbalanced, and those which are incomplete or show any alteration of form, or contain any additions or conditional or alternate bids that are not called for or otherwise permitted, may be rejected. A proposal on which the signature of the bidder has been omitted may be rejected. If, in the District's sole discretion, it determines any pricing, costs or other information submitted by a bidder may result in an unbalanced bid, the District may deem such bid non-responsive. A bid may be determined by the District to be unbalanced if the bid is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the District even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advanced payment.
22. Employment of Apprentices. The Contractor and all Subcontractors shall comply with the provisions of California Labor Code including, but not limited to sections 1777.5, 1777.6, and 1777.7 concerning the employment of apprentices. The Contractor and any Subcontractor under him shall comply with the requirements of said sections, including applicable portions of all subsequent amendments in the employment of apprentices; however, the Contractor shall have full responsibility for compliance with said Labor Code sections, for all apprenticeable occupations, regardless of any other contractual or employment relationships alleged to exist.

23. Non-Collusion Declaration. Public Contract Code section 7106 requires bidders to submit declaration of non-collusion with their bids. This form is included with the bid documents and must be signed and dated by the bidder under penalty of perjury.
24. Wage Rates, Travel and Subsistence.
- a. The Contractor and all subcontractors shall comply with the requirements set forth in Division 2, Part 7, Chapter 1 of the Labor Code. Pursuant to Labor Code section 1770 et seq., the District has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this work is to be performed for each craft, classification or type of worker needed to execute the contract. Copies are available from the District to any interested party on request and are also available from the Director of the Department of Industrial Relations. The Contractor shall obtain copies of the above-referenced prevailing wage sheets and post a copy of such wage rates at appropriate, conspicuous, weatherproof points at the Site.
 - b. Any worker employed to perform work on the Project and such work is not covered by any classification listed in the published general prevailing wage rate determinations or per diem wages determined by the Director of the Department of Industrial Relations, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to the employment of such person in such classification.
 - c. Holiday and overtime work, when permitted by law, shall be paid for at the rate set forth in the prevailing wage rate determinations issued by the Director of the Department of Industrial Relations or at least one and one-half (1½) times the specified basic rate of per diem wages, plus employer payments, unless otherwise specified in the Contract Documents or authorized by law.
 - d. These per diem rates, including holiday and overtime work, and employer payments for health and welfare, pension, vacation, and similar purposes, are on file at the administrative office of the District, located as noted above and are also available from the Director of the Department of Industrial Relations. It is the Contractor's responsibility to ensure the appropriate prevailing rates of per diem wages are paid for each classification. It shall be mandatory upon the Contractor to whom the Contract is awarded, and upon any subcontractor under such Contractor, to pay not less than the said specified rates to all workers employed by them in the execution of the Contract.
25. DIR Registration of Contractor and Subcontractors. A Contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in the Labor Code, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered Contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the Contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

This Project is a public works project as defined in Labor Code section 1720. Each contractor bidding on this Project and all subcontractors (of any tier) performing any portion of the Work must comply with the Labor Code sections 1725.5 and 1771.1 and must be properly and currently registered with DIR and qualified to perform public works pursuant to Labor Code section 1725.5

throughout the duration of the Project. For more information and up to date requirements, contractors are recommended to periodically review the DIR's website at www.dir.ca.gov. Contractor shall be solely responsible for ensuring compliance with Labor Code section 1725.5 as well as any requirements implemented by DIR applicable to its services or its subcontractors throughout the term of the Agreement and in no event shall Contractor be granted increased payment from the District or any time extensions to complete the Project as a result of Contractor's efforts to maintain compliance with the Labor Code or any requirements implemented by the DIR. Failure to comply with these requirements shall be deemed a material breach of this Agreement and grounds for termination for cause. The Contractor and all subcontractors shall furnish certified payroll records as required pursuant Labor Code section 1776 directly to the Labor Commissioner in accordance with Labor Code section 1771.4 on at least on a monthly basis (or more frequently if required by the District or the Labor Commissioner) and in a format prescribed by the Labor Commissioner. The District reserves the right to withhold contract payments if the District is notified, or determines as the result of its own investigation, that Contractor is in violation of any of the requirements set forth in Labor Code section 1720 et seq. at no penalty or cost to the District. Monitoring and enforcement of the prevailing wage laws and related requirements will be performed by the Labor Commissioner/ Department of Labor Standards Enforcement (DLSE).

26. No Telephone or Facsimile Availability. No telephone or facsimile machine will be available to bidders on the District premises at any time.
27. Obtaining Bidding Documents. Bidding Documents can be downloaded from the District's website at: <https://do.bonita.k12.ca.us/District/Business-Services/Purchasing/index.html>
28. Bidder shall utilize a complete set of Bidding Documents in preparing a bid. The failure or omission of bidder to receive any Bidding Document, form, instrument, Addendum, or other document shall not relieve bidder from any obligations with respect to the bid and/or Contract.
29. Addenda. Clarification or any other notice of a change in the Bidding Documents will be issued only by the District and only in the form of a written Addendum, transmitted e-mail to all who are known by the issuing office to have received a complete set of Bidding Documents. Any other purported Addenda are void and unenforceable.

Bidder is responsible for ascertaining the disposition of all Addenda issued regardless of District notification and to acknowledge all Addenda in the submitted sealed bid prior to the bid opening. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for inspection. Each Addendum will be numbered, dated, and identified with the Project number. Oral statements or any instructions in any form, other than Addendum as described above, shall be void and unenforceable. Addenda issued by the District and not noted as being acknowledged by bidder as required in the Bid Form, may result in the bid being deemed non-responsive.

30. CUPCCAA. This Project is being let in accordance with the California Uniform Public Construction Cost Accounting ("CUPCCAA") set forth in Public Contract Code section 22000 et seq. Bidders shall comply with any requirements set forth in the CUPCCAA including all guidelines and requirements in the current California Uniform Public Construction Cost Accounting Commission Cost Accounting Policies and Procedures Manual. If applicable, only Contractors included on the District's Qualified List shall submit bids for the Project as set forth in the CUPCCAA.
31. Debarment. Bidder may also be subject to debarment, in addition to seeking remedies for False Claims under Government Code section 12650 et seq. and Penal Code section 72, the District may

debar a Contractor pursuant to Article 15 of the General Conditions if the Board, or the Board may designate a hearing officer who, in his or her discretion, finds the Contractor has done any of the following:

- a. Intentionally or with reckless disregard, violated any term of a contract with the District
- b. Committed an act or omission which reflects on the Contractor's quality, fitness or capacity to perform work for the District;
- c. Committed an act or offense which indicates a lack of business integrity or business honesty; or,
- d. Made or submitted a false claim against the District or any other public entity (See Government Code section 12650, et seq., and Penal Code section 72).

CHECKLIST OF MANDATORY BID FORMS

(For Contractor's use and reference only. Additional documents may be required so bidders should carefully review all Contract Documents and Bid Documents)

1. Designation of Subcontractors
2. Bid Form
3. Contractor's Certificate Regarding Workers Compensation
4. Non-Collusion Declaration
5. Bid Bond (or Bid Guarantee form if Security is other than Bid Bond)
6. Substitution Request Form (If Substitution Request Form is not submitted then NO Substitutions will be allowed after the bids are opened)
7. Acknowledgment of Bidding Practices Regarding Indemnity
8. DVBE Participation Statement (**NOT REQUIRED**)
9. Contractor's Certificate Regarding Drug-Free Work Place
10. Contractor's Certificate Regarding Alcoholic Beverage and Tobacco-Free Campus Policy

DESIGNATION OF SUBCONTRACTORS

In compliance with the Subletting and Subcontracting Fair Practices Act (California Public Contract Code section 4100 et seq.,) and any amendments thereof, each Bidder shall set forth below: (a) the name, license number, and location of the place of business of each subcontractor who will perform work or labor or render service to the Contractor, who will perform work or labor or work or improvement to be performed under this Contract, or a subcontractor licensed by the State of California who, under subcontract to the Contractor, specially fabricates and installs a portion of the work or improvements according to detailed Drawings contained in the Plans and Specifications in an amount in excess of one-half of one percent of the Contractor's total bid; and (b) the portion and description of the work which will be done by each subcontractor under this Act. The Contractor shall list only one subcontractor for each such portion as is defined by the Contractor in this bid. All subcontractors shall be properly licensed by the California State Licensing Board.

If a Contractor fails to specify a subcontractor, or if a Contractor specifies more than one subcontractor for the same portion of work to be performed under the Contract in excess of one-half of one percent of the Contractor's total bid, the Contractor shall be deemed to have agreed that the Contractor is fully qualified to perform that portion, and that the Contractor alone shall perform that portion.

No Contractor whose bid is accepted shall (a) substitute any subcontractor, (b) permit any subcontractor to be voluntarily assigned or transferred or allow the relevant portion of the work to be performed by anyone other than the original subcontractor listed in the original bid, or (c) sublet or subcontract any portion of the work in excess of one-half of one percent of the Contractor's total bid where the original bid did not designate a subcontractor, except as authorized in the Subletting and Subcontracting Fair Practices Act.

A CONTRACTOR violating any of the provisions of Public Contract Code Section 4100 et seq. shall be deemed to be in violation of the Agreement and DISTRICT may exercise, after providing CONTRACTOR with the opportunity to a public hearing, the option, in its own discretion, of (1) canceling the Agreement or (2) assessing CONTRACTOR a penalty in an amount of not more than ten percent (10%) of the amount of the subcontract involved.

CONTRACTORS bidding this work shall require, pursuant to Public Contract Code section 4108, all Subcontractors providing labor and materials in excess of \$50,000 to supply an original signature and fully executed 100% Faithful Performance and 100% Payment Bond. All such Subcontractor bonds shall be delivered by CONTRACTOR to DISTRICT through ARCHITECT within ten (10) calendar days following CONTRACTOR's receipt of notification of the award of the Contract(s) for the Project. The failure by or refusal of a Subcontractor to comply with this requirement may result in that Subcontractor's substitution consistent with Public Contract Code sections 4108(b) and 4107(a)(4). All CONTRACTORS bidding on the Project must specify this requirement for Subcontractor bonds in their written or published request for Subcontractor bids. Failure of a CONTRACTOR to comply with this requirement may result in CONTRACTOR's bid being deemed non-responsive and the forfeiture to DISTRICT of CONTRACTOR's bid security.

The practice of issuing separate purchase orders and/or Subcontractors for the purpose of circumventing the Subcontractor bonding requirement shall not serve to exempt CONTRACTOR from these requirements.

NOTE: If alternate bids are called for and bidder intends to use different or additional subcontractors on the alternates, a separate list of subcontractors must be provided for each such Alternate.

DESIGNATION OF SUBCONTRACTORS FORM

Scope of Work	Name of Subcontractor	Location & Place of Business	License Type and Number	DIR Registration Number	<i>E-Mail & Telephone*</i>

In sign below, the CONTRACTOR covenants that it has complied with the signature requirements described in the Information to Bidders.

By: _____

Signature of Bidder

Date: _____

Address: _____

Phone: () _____

BID FORM

FOR

**GYMNASIUM HVAC REPLACEMENT –
SAN DIMAS HIGH SCHOOL & BONITA HIGH SCHOOL**

Bid No. 22-23:11

FOR

BONITA UNIFIED SCHOOL DISTRICT

CONTRACTOR
NAME:

ADDRESS:

TELEPHONE:

____ () _____

FAX:

____ () _____

EMAIL

TO: Bonita Unified School District, acting by and through its Governing Board, herein called "District".

1. Pursuant to and in compliance with your Notice Inviting Bids and other documents relating thereto, the undersigned bidder, having familiarized himself with the terms of the Contract, the local conditions affecting the performance of the Contract, the cost of the work at the place where the work is to be done, with the Drawings and Specifications, and other Contract Documents, hereby proposes and agrees to perform within the time stipulated, the Contract, including all of its component parts, and everything required to be performed, including its acceptance by the District, and to provide and furnish any and all labor, materials, tools, expendable equipment, and utility and transportation services necessary to perform the Contract and complete all of the Work in a workmanlike manner required in connection with the construction of:

BID NO. 22-23:11
GYMNASIUM HVAC REPLACEMENT –
SAN DIMAS HIGH SCHOOL & BONITA HIGH SCHOOL

in the District described above, all in strict conformance with the drawings and other Contract Documents on file at the Purchasing Office of said District for amounts set forth herein.

2. BIDDER ACKNOWLEDGES THE FOLLOWING ADDENDUM:

Number	Number	Number	Number	Number	Number	Number	Number
_____	_____	_____	_____	_____	_____	_____	_____

Acknowledge the inclusion of all addenda issued prior to bid in the blanks provided above. Your failure to do so may render your bid non-responsive.

3. BASE BID: (Include an Allowance of \$100,000.00 for each project listed below in each Base Bid)

San Dimas High School:

Written: _____ Dollar: \$ _____

Bonita High School:

Written: _____ Dollar: \$ _____

Total Base Bid for both projects including Allowances:

Written: _____ **Dollar: \$** _____

Note: A single contract will be awarded to the lowest bid based on the Base Bid Total for both projects.

4. ALLOWANCE: \$100,000.00 (One Hundred Thousand Dollars and 00/100) for each school. Include the specified Allowances in the Total Base Bid to be used at the District's discretion during construction. Refer to Specifications.

5. ALTERNATE BIDS: None

6. TIME FOR COMPLETION: The District may give a notice to proceed within ninety (90) days of the award of the bid by the District. Once the Contractor has received the notice to proceed, the Contractor shall complete the work in the time specified in the Agreement. By submitting this bid, Contractor has thoroughly studied this Project and agrees that the Contract Time for this Project is adequate for the timely and proper completion of the Project. Further, Contractor has included in the analysis of the time required for this Project, Rain Days, Governmental Delays, and the requisite time to complete Punch List.

In the event that the District desires to postpone giving the notice to proceed beyond this ninety (90) day period, it is expressly understood that with reasonable notice to the Contractor, giving the notice to proceed may be postponed by the District. It is further expressly understood by the Contractor, that the Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of giving the notice to proceed.

If the Contractor believes that a postponement will cause a hardship to it, the Contractor may terminate the contract with written notice to the District within ten (10) days after receipt by the Contractor of the District's notice of postponement. Should the Contractor terminate the Contract as a result of a notice of postponement, the District shall have the authority to award the Contract to the next lowest responsible bidder, if applicable.

It is understood that the District reserves the right to reject any or all bids and/or waive any irregularities or informalities in this bid or in the bid process. The Contractor understands that it may not withdraw this bid for a period of ninety (90) days after the date set for the opening of bids.

7. Attached is bid security in the amount of not less than ten percent (10%) of the bid:

Bid bond (10% of the Bid), certified check, or cashier's check (circle one)
8. The required List of Designated Subcontractors is attached hereto.
9. The required Non-Collusion Declaration is attached hereto.
10. The Substitution Request Form, if applicable, is attached hereto.
11. It is understood and agreed that if written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned after the opening of the bid, and within the time this bid is required to remain open, or at any time thereafter before this bid is withdrawn, the undersigned will execute and deliver to the District a Contract in the form attached hereto in accordance with the bid as accepted, and that he or she will also furnish and deliver to the District the Performance Bond and Payment Bond, all within five (5) calendar days after award of Contract, and that the work under the Contract shall be commenced by the undersigned bidder, if awarded the Contract, by the start date provided in the District's Notice to Proceed, and shall be completed by the Contractor in the time specified in the Contract Documents.
12. The names of all persons interested in the foregoing proposal as principals are as follows:

(IMPORTANT NOTICE: If bidder or other interested person is a corporation, state the legal name of such corporation, as well as the names of the president, secretary, treasurer, and manager thereof; if a co-partnership, state the true names of the firm, as well as the names of all individual co-partners comprising the firm; if bidder or other interested person is an individual, state the first and last names in full.)

13. PROTEST PROCEDURES. If there is a bid protest, the grounds shall be submitted as set forth in the Instructions to Bidders.
14. The undersigned bidder shall be licensed and shall provide the following California Contractor's license information:

License Number: _____

License Expiration Date: _____

Name on License: _____

Class of License: _____

DIR Registration Number: _____

If the bidder is a joint venture, each member of the joint venture must include the above information.

15. Time is of the essence regarding this Contract, therefore, in the event the bidder to whom the Contract is awarded fails or refuses to post the required bonds and return executed copies of the Agreement form within five (5) calendar days from the date of receiving the Notice of Award, the District may declare the bidder's bid deposit or bond forfeited as damages.
16. The bidder declares that he/she has carefully examined the location of the proposed Project, that he/she has examined the Contract Documents, including the Plans, General Conditions, Supplemental Conditions, Addenda, and Specifications, all others documents and requirements that are attached to and/or contained in the Project Manual, all other documents issued to bidders and read the accompanying instructions to bidders, and hereby proposes and agrees, if this proposal is accepted, to furnish all materials and do all work required to complete the said work in accordance with the Contract Documents, in the time and manner therein prescribed for the unit cost and lump sum amounts set forth in this Bid Form.
17. DEBARMENT. In addition to seeking remedies for False Claims under Government Code section 12650 et seq. and Penal Code section 72, the District may debar a Contractor pursuant to Article 15 of the General Conditions if the Board, or the Board may designate a hearing officer who, in his or her discretion, finds the Contractor has done any of the following:

- a. Intentionally or with reckless disregard, violated any term of a contract with the District;
 - b. Committed an act or omission which reflects on the Contractor's quality, fitness or capacity to perform work for the District;
 - c. Committed an act or offense which indicates a lack of business integrity or business honesty; or
 - d. Made or submitted a false claim against the District or any other public entity. (See Government Code section 12650, et seq., and Penal Code section 72)
18. DESIGNATION OF SUBCONTRACTORS. In compliance with the Subletting and Subcontracting Fair Practices Act (California Public Contract Code section 4100 et seq.) and any amendments thereof, each bidder shall list subcontractors on the District's form Subcontractor list. This subcontractor list shall be submitted with the bid and is a required form.
19. Each Bidder agrees that, if its bid is accepted, it shall perform at least 15 % of the Work, exclusive of supervisory and clerical work, without the services of any subcontractor. Bidder shall designate in its bid those portions of the Contractor Bidder intends to perform without the services of any Subcontractor, which satisfies the aforementioned 15% requirement.

I agree to receive service of notices at the e-mail address listed below.

I the below-indicated bidder, declare under penalty of perjury that the information provided and representations made in this bid are true and correct.

Proper Name of Company

Name of Bidder Representative

Street Address

City, State, and Zip

()
Phone Number

()
Fax Number

E-Mail

By: _____ Date: _____
Signature of Bidder Representative

NOTE: If bidder is a corporation, the legal name of the corporation shall be set forth above together with the signature of authorized officers or agents and the document shall bear the corporate seal; if bidder is a partnership, the true name of the firm shall be set forth above, together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership; and if bidder is an individual, his signature shall be placed above.

All signatures must be made in permanent blue ink.

CONTRACTOR'S CERTIFICATE REGARDING WORKERS' COMPENSATION FORM

Labor Code section 3700 in relevant part provides:

Every employer except the State shall secure the payment of compensation in one or more of the following ways:

1. By being insured against liability to pay compensation by one or more insurers duly authorized to write compensation insurance in this State.
2. By securing from the Director of Industrial Relations a certificate of consent to self-insure, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to employees.
3. For any county, city, city and county, municipal corporation, public district, public agency, or any political subdivision of the state, including each member of a pooling arrangement under a joint exercise of powers agreement (but not the state itself), by securing from the Director of Industrial Relations a certificate of consent to self-insure against workers' compensation claims, which certificate may be given upon furnishing proof satisfactory to the director of ability to administer workers' compensation claims properly, and to pay workers' compensation claims that may become due to its employees. On or before March 31, 1979, a political subdivision of the state which, on December 31, 1978, was uninsured for its liability to pay compensation, shall file a properly completed and executed application for a certificate of consent to self-insure against workers' compensation claims. The certificate shall be issued and be subject to the provisions of Section 3702.

I am aware of the provisions of Labor Code section 3700 which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provision before commencing the performance of the work of this Contract.

(Signature)

(Print)

(Date)

In accordance with Article 5 (commencing at section 1860), Chapter 1, Part 7, Division 2 of the Labor Code, the above certificate must be signed and submitted with the Contractor's bid.

NON-COLLUSION DECLARATION

The undersigned declares:

I am the _____ [Title] of _____ [Name of Company], the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____ [Date], at _____ [City], _____ [State].

Signed: _____

Typed Name: _____

BID GUARANTEE FORM
(Use only when not using a Bid Bond)

Accompanying this proposal is a cashier's check payable to the order of the Bonita Unified School District or a certified check payable to the order of the Bonita Unified School District in an amount equal to ten percent (10%) of the base bid and alternates (\$_____).

The proceeds of this check shall become the property of said District, if, this proposal shall be accepted by the District through the District's Governing Board, and the undersigned fails to execute a Contract with and furnish the sureties required by the District within the required time; otherwise, said check is to be returned to the undersigned.

Bidder

Note: Use this form, in lieu of Bid Bond form, when a cashier's check or certified check is accompanying the bid

BID BOND FORM

KNOW ALL MEN BY THESE PRESENT that we, the undersigned, (hereafter called "Principal"), and _____ (hereafter called "Surety"), are hereby held and firmly bound unto the Bonita Unified School District (hereafter called "District") in the sum of _____ (\$_____) for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors, and assigns.

SIGNED this _____ day of _____, 20__.

The condition of the above obligation is such that whereas the Principal has submitted to the District a certain Bid, attached hereto and hereby made a part hereof, to enter into a Contract in writing for the construction of _____.

NOW, THEREFORE,

- a. If said Bid is rejected, or
- b. If said Bid is accepted and the Principal executes and delivers a Contract or the attached Agreement form within five (5) calendar days after acceptance (properly completed in accordance with said Bid), and furnishes bonds for his faithful performance of said Contract and for payment of all persons performing labor or furnishing materials in connection therewith,

Then this obligation shall be void; otherwise, the same shall remain in force and effect.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Contract, or the call for bids, or the work to be performed thereunder, or the specifications accompanying the same, shall in anyway affect its obligation under this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of said Contract, or the call for bids, or the work, or to the specifications.

In the event suit is brought upon this bond by the District and judgment is recovered, the Surety shall pay all costs incurred by the District in such suit, including without limitation, attorneys' fees to be fixed by the court.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, on the day and year first set forth above.

(Corporate Seal)

By _____
Principal's Signature

Typed or Printed Name

Principal's Title

(Corporate Seal)

By _____
Surety's Signature

Typed or Printed Name

Title

(Attached Attorney in Fact Certificate)

Surety's Name

Surety's Address

Surety's Phone Number

IMPORTANT:

Surety companies executing bonds must possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance defined in California Insurance Code section 105, and if the work or project is financed, in whole or in part, with federal, grant, or loan funds, it must also appear on the Treasury Department's most current list (Circular 570 as amended).

THIS IS A REQUIRED FORM.

Any claims under this bond may be addressed to:

(Name and Address of Surety)

(Name and Address of agent or representative for service of process in California if different from above)

(Telephone Number of Surety and agent or representative for service of process in California).

REQUEST FOR SUBSTITUTION AT TIME OF BID

Pursuant to Public Contract Code section 3400, bidder submits the following request to Substitute with the bid that is submitted. I understand that if the request to substitute is not an “or equal” or is not accepted by District and I answer “no” I will not provide the specified item, then I will be held non-responsive and my bid will be rejected. With this understanding, I hereby request Substitution of the following articles, devices, equipment, products, materials, fixtures, patented processes, forms, methods, or types of construction:

	Specification Section	Specified Item	Requested Substituted Item	Contractor Agrees to Provide Specified Item if request to Substitute is Denied ¹ (circle one)	District Decision (circle one)
1.				Yes No	Grant Deny
2.				Yes No	Grant Deny
3.				Yes No	Grant Deny
4.				Yes No	Grant Deny
5.				Yes No	Grant Deny
6.				Yes No	Grant Deny
7.				Yes No	Grant Deny
8.				Yes No	Grant Deny
9.				Yes No	Grant Deny
10.				Yes No	Grant Deny
11.				Yes No	Grant Deny
12.				Yes No	Grant Deny

This Request Form must be accompanied by evidence as to whether the proposed Substitution (1) is equal in quality, service, and ability to the Specified Item; (2) will entail no change in detail, construction, and scheduling of related work; (3) will be acceptable in consideration of the required design and artistic effect; (4) will provide no cost disadvantage to the District; (5) will require no excessive or more expensive maintenance, including adequacy and

¹ Bidder must state whether bidder will provide the Specified Item in the event the Substitution request is evaluate and denied. If bidder states that bidder will not provide the Specified Item the denial of a request to Substitute shall result in the rejection of the bidder as non-responsive. However, if bidder states that bidder will provide the Specified Item in the event that bidder’s request for Substitution is denied, bidder shall execute the Agreement and provide the Specified Item(s). If bidder refuses to execute the Agreement due to the District’s decision to require the Specified Item(s) at no additional cost, bidder’s Bid Bond shall be forfeited.

availability of replacement parts; (6) will require no change of the construction schedule or milestones for the Project; and, (7) Contractor agrees to pay for any DSA Fees or other Governmental Plan check costs associated with this Substitution Request. (See General Conditions Section 3.6)

The undersigned states that the following paragraphs are correct:

1. The proposed Substitution does not affect the dimensions shown on the Drawings.
2. The undersigned will pay for changes to the building design, including Architect, engineering, or other consultant design, detailing, DSA plan check or other governmental plan check costs, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on other trades, the Contract Time, or specified warranty requirements.
4. Maintenance and service parts will be available locally for the proposed substitution.
5. In order for the Architect to properly review the substitution request, within five (5) days following the opening of bids, the Contractor shall provide samples, test criteria, manufacturer information, and any other documents requested by Architect or Architect's engineers or consultants, including the submissions that would ordinarily be required under Article 3.7 for Shop Drawings along with a document which provides a side by side comparison of key characteristics and performance criteria (often known as a CSI side by side comparison chart).
6. If Substitution Request is accepted by the District, Contractor is still required to provide a Submittal for the substituted item pursuant to Article 3.7 and shall provide required Schedule information (including schedule fragnets, if applicable) for the substituted item as required under Article 8.3.2.1. The approval of the Architect, Engineer, or District of the substitution request does not mean that the Contractor is relieved of Contractor's responsibilities for Submittals, Shop Drawings, and schedules under Article 3.7 and 8.3.2 if the Contractor is awarded the Project.

Name of Bidder: _____

By: _____

District: _____

By: _____

ACKNOWLEDGMENT OF BIDDING PRACTICES REGARDING INDEMNITY FORM

TO: Bonita Unified School District

RE: Bid Number 22-23:11

Construction Contract for Gymnasium HVAC Replacement for San Dimas High School and Bonita High School

Please be advised that with respect to the above-referenced Project the undersigned Contractor on behalf of itself and all subcontractors hereby waives the benefits and protection of Labor Code section 3864, which provides:

“If an action as provided in this chapter is prosecuted by the employee, the employer, or both jointly against the third person results in judgment against such third person, the employer shall have no liability to reimburse or hold such third person harmless on such judgment or settlement in the absence of a written agreement to do so executed prior to the injury.”

This Agreement has been signed by an authorized representative of the contracting party and shall be binding upon its successors and assignees. The undersigned further agrees to promptly notify the District of any changes of ownership of the contracting party or any subcontractor while this Agreement is in force.

Contracting Party

Name of Agent/Title

DISABLED VETERAN BUSINESS ENTERPRISE (DVBE) PARTICIPATION
STATEMENT (Not Required)

Each bidder must complete this form in order to comply with the Bonita Unified School District (“District”) policy for participation of disabled veteran business enterprises (School District projects funded in whole or in part by the State of California pursuant to the Leroy F. Greene School Facilities Act of 1998. (Education Code §17070.10, *et seq.*)

Project Name: Gymnasium HVAC Replacement for San Dimas High School and Bonita High School

Bid No.: 22-23:11

DSA No.: _____

The undersigned, on behalf of the Contractor named below, certifies that the Contractor has made reasonable efforts to secure participation by DVBE in the Contract to be awarded for the above-referenced Bid No., including participation by DVBE subcontractors and/or material suppliers. **Check only one of the following:**

- ☐ The Contractor was unable after reasonable efforts to secure DVBE participation in the Contract for the above-referenced Project/Bid No. However, the Contractor will use DVBE services if the opportunity arises at any time during construction of the Project. Upon completion of the Project, the Contractor will report to the District the total dollar amount of DVBE participation in any Contract awarded to Contractor, and in any change orders, for the above-referenced Project.
- ☐ The Contractor has secured DVBE participation in the Contract for the above referenced Project/Bid No., and anticipates that such DVBE participation will equal approximately _____ dollars (\$ _____), which represents approximately _____ percent (____%) of the total Contract for such Project. Upon completion of the Project, Contractor will report to the District the actual total dollar amount of DVBE participation in the Contract awarded to Contractor, and in any change orders, for such Project

Company: _____

Name: _____

Title: _____

Signature: _____

Date: _____

CONTRACTOR'S CERTIFICATE REGARDING DRUG-FREE WORKPLACE

This Drug-Free Workplace Certification form is required from all successful bidders pursuant to the requirements mandated by Government Code section 8350 et seq., the Drug-Free Workplace Act of 1990. The Drug-Free Workplace Act of 1990 requires that every person or organization awarded a contract or grant for the procurement of any property or service from any State agency must certify that it will provide a drug-free workplace by performing certain specified acts. In addition, the Act provides that each contract or grant awarded by a State agency may be subject to suspension of payments or termination of the contract or grant, and the Contractor or grantee may be subject to debarment from future contracting, if the contracting agency determines that specified acts have occurred.

Pursuant to Government Code section 8355, every person or organization awarded a contract or grant from a State agency shall certify that it will provide a drug-free workplace by doing all of the following:

1. Publishing a statement, notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the person's or organization's workplace, and specifying actions which will be taken against employees for violations of the prohibition.
2. Establishing a drug-free awareness program to inform employees about all of the following:
 - a. The dangers of drug abuse in the workplace;
 - b. The person's or organization's policy of maintaining a drug-free workplace;
 - c. The availability of drug counseling, rehabilitation and employee-assistance programs; and
 - d. The penalties that may be imposed upon employees for drug abuse violations;
3. Requiring that each employee engaged in the performance of the contract or grant be given a copy of the statement required by subdivision (a) and that, as a condition of employment on the contract or grant, the employee agrees to abide by the terms of the statement.

I, the undersigned, agree to fulfill the terms and requirements of Government Code section 8355 listed above and will (a) publish a statement notifying employees concerning the prohibition of controlled substance at the workplace, (b) establish a drug-free awareness program, and (c) require each employee engaged in the performance of the contract be given a copy of the statement required by section 8355(a) and require such employee agree to abide by the terms of that statement.

I also understand that if the Bonita Unified School District determines that I have either (a) made a false certification herein, or (b) violated this certification by failing to carry out the requirements of Section 8355, that the contract awarded herein is subject to termination, suspension of payments, or both. I further understand that, should I violate the terms of the Drug-Free Workplace Act of 1990, I may be subject to debarment in accordance with the requirements of Section 8350 et seq.

I acknowledge that I am aware of the provisions of Government Code section 8350 et seq. and hereby certify that I will adhere to the requirements of the Drug-Free Workplace Act of 1990.

DATE: _____

CONTRACTOR

By: _____
Signature

**CONTRACTOR’S CERTIFICATE REGARDING ALCOHOLIC BEVERAGE AND
TOBACCO-FREE CAMPUS POLICY**

The Contractor agrees that it will abide by and implement the District’s Alcoholic Beverage and Tobacco-Free Campus Policy, which prohibits the use of alcoholic beverages and tobacco products, of any kind and at any time, in District-owned or leased buildings, on DISTRICT property and in DISTRICT vehicles. The Contractor shall procure signs stating “ALCOHOLIC BEVERAGE AND TOBACCO USE IS PROHIBITED” and shall ensure that these signs are prominently displayed in all entrances to school property at all times.

DATE: _____

CONTRACTOR

By: _____
Signature

[End of Bid Documents to be Submitted with Bid]

AGREEMENT FORM

THIS AGREEMENT, entered into this ____ day of _____, 2023 in the County of Los Angeles of the State of California, by and between the Bonita Unified School District, hereinafter called the “District”, and _____ hereinafter called the “Contractor”.

WITNESSETH that the District and the Contractor for the consideration stated herein agree as follows:

ARTICLE 1 - SCOPE OF WORK: The Contractor shall furnish all labor, materials, equipment, tools, and utility and transportation services, and perform and complete all work required in connection with San Dimas High School Culinary Arts Modernization (“Project”) in strict accordance with the Contract Documents enumerated in Article 7 below. The Contractor shall be liable to the District for any damages arising as a result of a failure to comply with that obligation, and the Contractor shall not be excused with respect to any failure to so comply by an act or omission of the Architect, Engineer, Inspector, Division of the State Architect (DSA), or representative of any of them, unless such act or omission actually prevents the Contractor from fully complying with the Contract Documents and the Contractor protests, in accordance with the Contract Documents, that the act or omission is preventing the Contractor from fully complying with the Contract Documents. Such protest shall not be effective unless reduced to writing and filed with the District office within seven (7) days of the date of occurrence of such act or omission preventing the Contractor from fully complying with the Contract Documents.

ARTICLE 2 - TIME OF COMPLETION: The District may give notice to proceed within ninety (90) days of the award of the bid by the District. Once the Contractor has received a notice to proceed, the Contractor shall reach Substantial Completion (See Article 1.1.46) of the Work within **One Hundred Twenty (120)** calendar days from receipt of the Notice to Proceed. This shall be called Contract Time. (See Article 8.1.1). It is expressly understood that time is of the essence.

Contractor has thoroughly studied the Project and has satisfied itself that the time period for this Project was adequate for the timely and proper completion of the Project within each milestone and within the Contract time. Further, Contractor has included in the analysis of the time required for this Project, items set forth in General Conditions Article 8.3.2.1, Submittal Schedules, Rain Day Float, and Governmental Delay Float.

In the event that the District desires to postpone giving the notice to proceed beyond this ninety (90) day period, it is expressly understood that with reasonable notice to the Contractor, giving the notice to proceed may be postponed by the District. It is further expressly understood by the Contractor, that the Contractor shall not be entitled to any claim of additional compensation as a result of the District’s postponement of giving the notice to proceed.

If the Contractor believes that a postponement will cause hardship to it, the Contractor may terminate the Contract with written notice to the District within ten (10) days after receipt by the Contractor of the District’s notice of postponement. It is further understood by the Contractor that in the event that the Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay the Contractor for the work performed by the Contractor at the time of notification of postponement. Should the Contractor terminate the Contract as a result of a notice of postponement, the District shall have the authority to award the Contract to the next lowest responsible bidder.

ARTICLE 3 - LIQUIDATED DAMAGES: It being impracticable and infeasible to determine the amount of actual damage, it is agreed that the Contractor will pay the District the sum of **Five Hundred Dollars (\$500.00)** per calendar day for each and every day of delay beyond the Contract Time set forth in Article 2 of this Agreement (inclusive of Milestones that are critical on the critical path or noted as critical to the District) as liquidated damages and not as a penalty or forfeiture. In the event Liquidated Damages are not paid, the Contractor further agrees that the District may deduct such amount thereof from any money due or that may become due the Contractor under the Contract (See Article 9.6 and 2.2 of the General Conditions).

ARTICLE 4 - CONTRACT PRICE: The District shall pay to the Contractor as full consideration for the faithful performance of the Contract, subject to any additions or deductions as provided in the Contract Documents, the sum of _____ Dollars (\$ _____), said sum being the total amount stipulated in the Bid Contractor submitted. Payment shall be made as set forth in the General Conditions.

Should any Change Order result in an increase in the Contract Price, the cost of such Change Order shall be agreed to in advance by the Contractor and the District, subject to the monetary limitations set forth in Public Contract Code section 20118.4. In the event that the Contractor proceeds with a Change in work without an agreement between the District and Contractor regarding the cost of a Change Order, the Contractor waives any Claim of additional compensation for such additional work.

ARTICLE 5 - HOLD HARMLESS AGREEMENT: Contractor shall defend, indemnify and hold harmless District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors from all liabilities, claims, actions, liens, judgments, demands, damages, losses, costs or expenses of any kind arising from death, personal injury, property damage or other cause based or asserted upon any act, omission, or breach connected with or arising from the progress of Work or performance of service under this Agreement or the Contract Documents. As part of this indemnity, Contractor shall protect and defend, at its own expense, District, Architect, Construction Manager, Inspector, the State of California and their officers, employees, agents and independent contractors from any legal action including attorney's fees or other proceeding based upon such act, omission, breach or as otherwise required by this Article.

Furthermore, Contractor agrees to and does hereby defend, indemnify and hold harmless District, Architect, Construction Manager, Inspector, the State of California and their officers, employees, agents and independent contractors from every claim or demand made, and every liability, loss, damage, expense or attorney's fees of any nature whatsoever, which may be incurred by reason of:

- (a) Liability for (1) death or bodily injury to persons; (2) damage or injury to, loss (including theft), or loss of use of, any property; (3) any failure or alleged failure to comply with any provision of law or the Contract Documents; or (4) any other loss, damage or expense, sustained by any person, firm or corporation or in connection with the Work called for in this Agreement or the Contract Documents, except for liability resulting from the sole or active negligence, or the willful misconduct of the District.
- (b) Any bodily injury to or death of persons or damage to property caused by any act, omission or breach of Contractor or any person, firm or corporation employed by Contractor, either directly or by independent contract, including all damages or injury to or death of persons, loss (including theft) or loss of use of any property, sustained by any person, firm or corporation, including the District, arising out of or in any way connected with Work covered by this Agreement or the Contract Documents, whether said injury or damage occurs either

on or off District property, but not for any loss, injury, death or damages caused by the sole or active negligence or willful misconduct of the District.

- (c) Any dispute between Contractor and Contractor's subcontractors/suppliers/ Sureties, including, but not limited to, any failure or alleged failure of the Contractor (or any person hired or employed directly or indirectly by the Contractor) to pay any Subcontractor or Materialman of any tier or any other person employed in connection with the Work and/or filing of any stop notice or mechanic's lien claims.
- (d) Any claims, allegations, penalties, assessments, or liabilities to the extent caused by the Contractor's failure or the failure of any Subcontractor of any tier, to fully comply with the DIR registration requirements under Labor Code section 1725.5 at all times during the performance of any Work on the Project and shall reimburse the District for any penalties assessed against the District arising from any failure by the Contractor or any Subcontractor of any tier from complying with Labor Code sections 1725.5 and 1771.1. Nothing in this paragraph, however, shall require the Contractor or any Subcontractor to be liable to the District or indemnify the District for any penalties caused by the District in accordance with Labor Code section 1773.3 (g).

Contractor, at its own expense, cost, and risk, shall defend any and all claims, actions, suits, or other proceedings that may be brought or instituted against the District, its officers, agents or employees, on account of or founded upon any cause, damage, or injury identified herein Article 5 and shall pay or satisfy any judgment that may be rendered against the District, its officers, agents or employees in any action, suit or other proceedings as a result thereof.

The Contractor's and Subcontractors' obligation to defend, indemnify and hold harmless the Owner, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors hereunder shall include, without limitation, any and all claims, damages, and costs for the following: (1) any damages or injury to or death of any person, and damage or injury to, loss (including theft), or loss of use of, any property; (2) breach of any warranty, express or implied; (3) failure of the Contractor or Subcontractors to comply with any applicable governmental law, rule, regulation, or other requirement; (4) products installed in or used in connection with the Work; and (5) any claims of violation of the Americans with Disabilities Act ("ADA").

ARTICLE 6 - PROVISIONS REQUIRED BY LAW: Each and every provision of law and clause required to be inserted in this Contract shall be deemed to be inserted herein, and this Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted or is not inserted correctly, then upon application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

ARTICLE 7 - COMPONENT PARTS OF THE CONTRACT: The Contract entered into by this Agreement consists of the following Contract Documents, all of which are component parts of the Contract as if herein set out in full or attached hereto.

Notice Inviting Bids
Instructions to Bidders
Designation of Subcontractors
Non-Collusion Declaration
Bid Guarantee Form
Bid Bond

Bid Form
 Contractor's Certificate Regarding Worker's Compensation
 Acknowledgment of Bidding Practices Regarding Indemnity
 DVBE Participation Statement and Close-Out Forms (**Not Required**)
 Agreement Form
 Payment Bond
 Performance Bond
 Guarantee
 Escrow Agreement for Security Deposit In Lieu of Retention
 Workers' Compensation/Employers Liability Endorsement
 General Liability Endorsement
 Automobile Liability Endorsement
 Contractor's Certificate Regarding Drug-Free Workplace
 Contractor's Certificate Regarding Alcohol and Tobacco
 Contractor's Certificate Regarding Background Checks
 General Conditions
 Supplementary and Special Conditions
 Specifications
 All Addenda as Issued
 Drawings/Plans
 Substitution Request Form
 Requirements, Reports and/or Documents in the Project Manual or Other Documents Issued to Bidders

All of the above named Contract Documents are intended to be complementary. Work required by one of the above named Contract Documents and not by others shall be done as if required by all.

ARTICLE 8 - PREVAILING WAGES: Wage rates for this Project shall be in accordance with the general prevailing rate of holiday and overtime work in the locality in which the work is to be performed for each craft, classification, or type of work needed to execute the Contract as determined by the Director of the Department of Industrial Relations. Copies of schedules of rates so determined by the Director of the Department of Industrial Relations are on file at the administrative office of the District and are also available from the Director of the Department of Industrial Relations. Monitoring and enforcement of the prevailing wage laws and related requirements will be performed by the Labor Commissioner/ Department of Labor Standards Enforcement (DLSE).

The following are hereby referenced and made a part of this Agreement and Contractor stipulates to the provisions contained therein.

1. Chapter 1 of Part 7 of Division 2 of the Labor Code (Section 1720 et seq.)
2. California Code of Regulations, Title 8, Chapter 8, Subchapters 3 through 6 (Section 16000 et seq.)

ARTICLE 9 - RECORD AUDIT: In accordance with Government Code section 8546.7 (and Davis Bacon, if applicable) and Article 13.11 of the General Conditions, records of both the District and the Contractor shall be subject to examination and audit for a period of five (5) years after a Final Retention Payment or the Recording of a Notice of Completion, whichever occurs first.

ARTICLE 10 - CONTRACTOR'S LICENSE: The Contractor must possess throughout the Project a Class B - General Contractor's License, issued by the State of California, which must be current and in good standing.

IN WITNESS WHEREOF, this Agreement has been duly executed by the above named parties, on the day and year first above written.

Bonita Unified School District

CONTRACTOR:

By: Sonia Gomez Eckley

Typed or Printed Name

By: _____
Asst. Superintendent of Business Services

Title

Dated: _____

Signature

Type or Printed Name

Title (Authorized Officers or Agents)

Signature

(CORPORATE SEAL)

PAYMENT BOND
(CALIFORNIA PUBLIC WORK)

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the BONITA UNIFIED SCHOOL DISTRICT (sometimes referred to hereinafter as "Obligee") has awarded to _____ (hereinafter designated as the "Principal" or "Contractor"), an agreement for the work described as follows: Bid 22-23:11 Gymnasium HVAC Replacement – Sand Dimas High School & Bonita High School (hereinafter referred to as the "Public Work"); and

WHEREAS, said Contractor is required to furnish a bond in connection with said Contract, and pursuant to California Civil Code section 9550;

NOW, THEREFORE, We, _____, the undersigned Contractor, as Principal; and _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the BONITA UNIFIED SCHOOL DISTRICT and to any and all persons, companies, or corporations entitled by law to file stop notices under California Civil Code section 9100, or any person, company, or corporation entitled to make a claim on this bond, in the sum of _____ Dollars (\$ _____), such sum being not less than one hundred percent (100%) of the total amount payable by said Obligee under the terms of said Contract, for which payment will and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal, its heirs, executors, administrators, successors, or assigns, or subcontractor, shall fail to pay any person or persons named in Civil Code section 9100; or fail to pay for any materials, provisions, or other supplies, used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code, with respect to work or labor thereon of any kind; or shall fail to deduct, withhold, and pay over to the Employment Development Department, any amounts required to be deducted, withheld, and paid over by Unemployment Insurance Code section 13020 with respect to work and labor thereon of any kind, then said Surety will pay for the same, in an amount not exceeding the amount herein above set forth, and in the event suit is brought upon this bond, also will pay such reasonable attorneys' fees as shall be fixed by the court, awarded and taxed as provided in California Civil Code section 9550 et seq.

This bond shall inure to the benefit of any person named in Civil Code section 9100 giving such person or his/her assigns a right of action in any suit brought upon this bond.

It is further stipulated and agreed that the Surety of this bond shall not be exonerated or released from the obligation of the bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, or specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described; or pertaining or relating to the furnishing of labor, materials, or equipment therefor; nor by any change or modification of any terms of payment or extension of time for payment pertaining or relating to any scheme or work of improvement herein above described;

nor by any rescission or attempted rescission of the contract, agreement or bond; nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond; nor by any fraud practiced by any person other than the claimant seeking to recover on the bond; and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given; and under no circumstances shall the Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the Obligee and the Contractor or on the part of any obligee named in such bond; that the sole condition of recovery shall be that the claimant is a person described in California Civil Code section 9100, and who has not been paid the full amount of his or her claim; and that the Surety does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned.

IN WITNESS WHEREOF this instrument has been duly executed by the Principal and Surety above named, on the _____ day of _____, 20__.

PRINCIPAL/CONTRACTOR:

By: _____

SURETY:

By: _____

Attorney-in-Fact

Surety companies executing bonds must possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance defined in California Insurance Code section 105, and if the work or project is financed, in whole or in part, with federal, grant or loan funds, Surety's name must also appear on the Treasury Department's most current list (Circular 570 as amended).

(Name and Address of Surety)

(Name and Address of agent or representative for service for service of process in California)

Telephone: _____

A notary public or other office completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA)
) ss.
COUNTY OF)

On _____, before me, _____, personally appeared _____, who proved on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies) as the Attorney-in-Fact of _____ (Surety) and acknowledged to me that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public in and for said State

(SEAL)

Commission expires: _____

NOTE: A copy of the power-of-attorney to local representatives of the bonding company must be attached hereto.

PERFORMANCE BOND
(CALIFORNIA PUBLIC WORK)

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the BONITA UNIFIED SCHOOL DISTRICT (sometimes referred to hereinafter as "Obligee") has awarded to _____ (hereinafter designated as the "Principal" or "Contractor"), an agreement for the work described as follows: _____ (hereinafter referred to as the "Public Work"); and

WHEREAS, the work to be performed by the Contractor is more particularly set forth in that certain contract for said Public Work dated _____, (hereinafter referred to as the "Contract"), which Contract is incorporated herein by this reference; and

WHEREAS, the Contractor is required by said Contract to perform the terms thereof and to provide a bond both for the performance and guaranty thereof.

NOW, THEREFORE, we, _____, the undersigned Contractor, as Principal, and _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the BONITA UNIFIED SCHOOL DISTRICT in the sum of _____ Dollars (\$ _____), said sum being not less than one hundred percent (100%) of the total amount payable by said Obligee under the terms of said Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if the bounded Contractor, his or her heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and agreements in said Contract and any alteration thereof made as therein provided, on his or her part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill guarantees of all materials and workmanship; and indemnify, defend and save harmless the Obligee, its officers and agents, as stipulated in said Contract, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that it shall not be exonerated or released from the obligation of this bond (either by total exoneration or pro tanto) by any change, extension of time, alteration in or addition to the terms of the contract or to the work to be performed there under or the specifications accompanying the same, nor by any change or modification to any terms of payment or extension of time for any payment pertaining or relating to any scheme of work of improvement under the contract. Surety also stipulates and agrees that it shall not be exonerated or released from the obligation of this bond (either by total exoneration or pro tanto) by any overpayment or underpayment by the Obligee that is based upon estimates approved by the Architect. The Surety stipulates and agrees that none of the aforementioned changes, modifications, alterations, additions, extension of time or actions shall in any way affect its obligation on this bond, and it does hereby waive notice of any such changes, modifications,

alterations, additions or extension of time to the terms of the contract, or to the work, or the specifications as well notice of any other actions that result in the foregoing.

Whenever Principal shall be, and is declared by the Obligor to be, in default under the Contract, the Surety shall promptly either remedy the default, or shall promptly take over and complete the Contract through its agents or independent contractors, subject to acceptance and approval of such agents or independent contractors by Obligor as hereinafter set forth, in accordance with its terms and conditions and to pay and perform all obligations of Principal under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of Liquidated Damages; or, at Obligor's sole discretion and election, Surety shall obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Obligor of the lowest responsible bidder, arrange for a contract between such bidder and the Obligor and make available as Work progresses (even though there should be a default or succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the "balance of the Contract Price" (as hereinafter defined), and to pay and perform all obligations of Principal under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of Liquidated Damages. The term "balance of the Contract Price," as used in this paragraph, shall mean the total amount payable to Principal by the Obligor under the Contract and any modifications thereto, less the amount previously paid by the Obligor to the Principal, less any withholdings by the Obligor allowed under the Contract. Obligor shall not be required or obligated to accept a tender of a completion contractor from the Surety.

Surety expressly agrees that the Obligor may reject any agent or contractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Principal. Unless otherwise agreed by Obligor, in its sole discretion, Surety shall not utilize Principal in completing the Contract nor shall Surety accept a bid from Principal for completion of the work in the event of default by the Principal.

No final settlement between the Obligor and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

The Surety shall remain responsible and liable for all patent and latent defects that arise out of or relate to the Contractor's failure and/or inability to properly complete the Public Work as required by the Contract and the Contract Documents. The obligation of the Surety hereunder shall continue so long as any obligation of the Contractor remains.

Contractor and Surety agree that if the Obligor is required to engage the services of an attorney in connection with enforcement of the bond, Contractor and Surety shall pay Obligor's reasonable attorneys' fees incurred, with or without suit, in addition to the above sum.

In the event suit is brought upon this bond by the Obligor and judgment is recovered, the Surety shall pay all costs incurred by the Obligor in such suit, including reasonable attorneys' fees to be fixed by the Court.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this ____ day of _____, 20__.

PRINCIPAL/CONTRACTOR:

By: _____

SURETY:

By: _____

Attorney-in-Fact

The rate of premium on this bond is _____ per thousand.

The total amount of premium charged: \$ _____ (This must be filled in by a corporate surety).

IMPORTANT: THIS IS A REQUIRED FORM.

Surety companies executing bonds must possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance defined in California Insurance Code section 105, and if the work or project is financed, in whole or in part, with federal, grant or loan funds, Surety's name must also appear on the Treasury Department's most current list (Circular 570 as amended).

Any claims under this bond may be addressed to:

(Name and Address of Surety)

(Name and Address of agent or representative for service for service of process in California)

Telephone: _____

Telephone: _____

A notary public or other office completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA)
) ss.
COUNTY OF)

On _____, before me, _____, personally appeared _____, who proved on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies) as the Attorney-in-Fact of _____ (Surety) and acknowledged to me that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public in and for said State

(SEAL)

Commission expires:_____

NOTE: A copy of the power-of-attorney to local representatives of the bonding company must be attached hereto.

GUARANTEE

Guarantee for _____ . We hereby guarantee that the _____, which we have installed in _____ has been done in accordance with the Contract Documents, including without limitation, the drawings and specifications, and that the work as installed will fulfill the requirements included in the bid documents. The undersigned and its surety agrees to repair or replace any or all such work, together with any other adjacent work, which may be displaced in connection with such replacement, that may prove to be defective in workmanship or material within a period of One (1) year from the date of the Notice of Completion of the above-mentioned structure by the Bonita Unified School District, ordinary wear and tear and unusual abuse or neglect excepted.

In the event the undersigned or its surety fails to comply with the above-mentioned conditions within a reasonable period of time, as determined by the District, but not later than ten (10) days after being notified in writing by the District or within forty eight (48) hours in the case of an emergency or urgent matter, the undersigned and its surety authorizes the District to proceed to have said defects repaired and made good at the expense of the undersigned and its surety, who will pay the costs and charges therefor upon demand. The undersigned and its surety shall be jointly and severally liable for any costs arising from the District's enforcement of this Guarantee.

Countersigned

(Proper Name)

(Proper Name)

By: _____

By: _____

(Signature of Subcontractor or Contractor)

(Signature of General Contractor if for Subcontractor)

Representatives to be contacted for service:

Name: _____

Address: _____

Phone Number: _____

ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between the Bonita Unified School District, 115 W. Allen Avenue, San Dimas, CA 91773, hereinafter called "Owner", and _____ whose address is _____, hereinafter called "Contractor", and _____ whose address is _____, hereinafter called "Escrow Agent".

For the consideration hereinafter set forth, the Owner, Contractor and Escrow Agent agree as follows:

1. Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for Retention earnings required to be withheld by Owner pursuant to the Construction Contract entered into between the Owner and Contractor for _____ in the amount of _____ dated _____ (hereinafter referred to as the "Contract"). Alternatively, on written request of the Contractor, the Owner shall make payments of the Retention earnings directly to the escrow agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the Owner within ten (10) days of deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as Retention under the terms of the Contract between the Owner and Contractor. Securities shall be held in the name of the Owner, and shall designate the Contractor as beneficial owner.
2. The Owner shall make progress payments to the Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.
3. When the Owner makes payments of Retentions earned directly to the Escrow Agent, the Escrow Agent shall hold them for the benefit of the Contractor until such time as the escrow created under this Contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this Agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the Owner pays the Escrow Agent directly.
4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of the Owner. These expenses and payment terms shall be determined by the Owner, Contractor, and Escrow Agent.
5. The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Owner.
6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from the Owner to the Escrow Agent that Owner consents to the withdrawal of the amount sought to be withdrawn by Contractor.
7. The Owner shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven (7) days' written notice to the Escrow Agent from the Owner of the notice of default under Article 2.2, Article 9.6 or Article 14, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the Owner.

8. Upon receipt of written notification from the Owner certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payment of fees and charges.
9. Escrow Agent shall rely on the written notifications from the Owner and the Contractor pursuant to Sections (5) to (8), inclusive, of this Agreement and the Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.
10. The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Owner and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of Owner:

Title

Name

Signature

Address

On behalf of Contractor:

Title

Name

Signature

Address

On behalf of Agent:

Title

Name

Signature

Address

At the time the Escrow Account is opened, the Owner and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date set forth above.

OWNER

CONTRACTOR

Title

Title

Name

Name

Signature

Signature

INSURANCE DOCUMENTS & ENDORSEMENTS

The following insurance endorsements and documents must be provided to the Bonita Unified School District within five (5) calendar days after receipt of notification of award. If the apparent low bidder fails to provide the documents required below, the District may award the Contract to the next lowest responsible and responsive bidder or release all bidders, and the bidder's bid security will be forfeited. All insurance provided by the bidder shall fully comply with the requirements set forth in Article 11 of the General Conditions.

1. **General Liability Insurance:** Certificate of Insurance with all specific insurance coverages set forth in Article 11 of the General Conditions, proper Project description, designation of the District as the Certificate Holder, a statement that the insurance provided is primary to any insurance obtained by the District and minimum of 30 days' cancellation notice. Bidder shall also provide required additional insured endorsement(s) designating all parties required in Article 11 of the General Conditions. The additional insured endorsement shall be an ISO CG 20 10 (04/13), or an ISO CG 20 38 (04/13), or their equivalent as determined by the District in its sole discretion.

Incidents and claims are to be reported to the insurer at:

Attn: _____
(Title) _____ (Department) _____

(Company) _____

(Street Address) _____

(City) _____ (State) _____ (Zip Code) _____
(_____) _____
(Telephone Number)

2. **Workers' Compensation/ Employer's Liability Insurance:** Certificate of Workers' Compensation Insurance meeting the coverages and requirements set forth in Article 11 of the General Conditions, minimum of 30 days' cancellation notice, proper Project description, waiver of subrogation and any applicable endorsements.
3. **Automobile Liability Insurance:** Certificate of Automobile Insurance meeting the coverages and requirements set forth in Article 11 of the General Conditions, minimum 30 days' cancellation notice, any applicable endorsements and a statement that the insurance provided is primary to any insurance obtained by the District.

Incidents and claims are to be reported to the insurer at:

Attn: _____
(Title) _____ (Department) _____

(Company)

(Street Address)

(City)

(State)

(Zip Code)

(_____) _____
(Telephone Number)

DATE: _____

CONTRACTOR

By: _____

Signature

**DISABLED VETERAN BUSINESS ENTERPRISE (DVBE) CONTRACTOR CLOSE-
OUT STATEMENT**

The Contractor shall complete this form, as a condition to Final Payment, for purposes of reporting participation by Disabled Veteran Business Enterprises (DVBE) in the Contract for the Project/Bid No. specified below.

Project Name: _____

Bid No.: _____

DSA No.: _____

Name	Address/Phone	Category of Work*	\$ Amount of Contract

* Categories of work include: (1) construction services (specify services that DVBE will provide); (2) architecture and engineering services; (3) procurement of materials, supplies and equipment; and (4) information technology.

The undersigned, on behalf of the Contractor, certifies that DVBE participation on the Contract for Bid No. _____ equaled _____ dollars (\$ _____), which represents approximately _____ percent (____%) of the total Contract price including change orders for the Project.

Company: _____

Name: _____

Title: _____

Signature: _____

Date: _____

CONTRACTOR CERTIFICATION REGARDING BACKGROUND CHECKS

(Modernization Projects)

_____ certifies that it has performed one of the following:
[Name of contractor/consultant]

Pursuant to Education Code section 45125.1, Contractor has conducted criminal background checks, through the California Department of Justice, of all employees providing services to the _____ District, pursuant to the contract/purchase order dated _____, and that none have been convicted of serious or violent felonies, as specified in Penal Code sections 1192.7(c) and 667.5(c), respectively.

As further required by Education Code section 45125.1, attached hereto as Attachment “A” is a list of the names of the employees of the undersigned who may come in contact with pupils.

OR

Pursuant to Education Code section 45125.2, Contractor will ensure the safety of pupils by one or more of the following methods:

1. The installation of a physical barrier at the worksite to limit contact with pupils.
2. Continual supervision and monitoring of all employees of the entity by an employee of the entity whom the Department of Justice has ascertained has not been convicted of a violent or serious felony.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct.

Date _____, 20__

[Name of Contractor/Consultant]

By its: _____

ATTACHMENT A:

CONTRACTOR CERTIFICATION REGARDING BACKGROUND CHECKS

(INSERT NAMES OF EMPLOYEES WHO MAY COME IN CONTACT WITH PUPILS)

GENERAL CONDITIONS

ARTICLE 1 DEFINITIONS

1.1 BASIC DEFINITIONS

NOTE: The following shall not be construed as a comprehensive list of all definitions in the Contract Documents and there may be other definitions set forth in the Contract Documents. Additionally, any references to any DSA forms, documents or requirements shall be construed to incorporate any updates, supplements, or additions. The Contractor shall be required to meet the latest DSA requirements applicable to the Project.

- 1.1.1 Action of the Governing Board is a vote of a majority of the District's Governing Board.
- 1.1.2 Approval means written authorization through action of the Governing Board. The Governing board has delegated to the Assistant Superintendent the authority to approve certain modifications, Change Orders or Immediate Change Directives (Subject to the limits of the Delegation of Authority provided by the Board). In no case shall the Assistant Superintendent have authority to approve total Change Orders or Modifications to the Project exceeding 10% of the Contract Sum.
- 1.1.3 Architect means the architect, engineer, or other design professional engaged by the District to design and perform general observation of the work of construction and interpret the Drawings and Specifications for the Project. (See ARTICLE 4)
- 1.1.4 As-Builts are a set of Plans and Specifications maintained by the Contractor clearly showing all changes, revisions, substitutions, field changes, final locations, and other significant features of the Project. The As-Builts shall be maintained continuously throughout the Work for the Project and is both a prerequisite to the issuance of Payment Application and a requirement for Contract Close-Out. (See Article 3.17)
- 1.1.5 Beneficial Occupancy is the point in time when a building or buildings are fit for occupancy is fit for occupancy and its intended use. Basic requirements are the building is safe, at or near Substantial Completion, and all fire/ life safety items are approved and operational. The fact that a building is occupied does not mean that the building is ready for Beneficial Occupancy if there are elements that are unsafe or if fire/ life safety items are not approved and operational. Taking occupancy on a structure that is under a fire watch is not considered beneficial occupancy. Further, taking of Beneficial Occupancy is not a point in time when retention is due unless the entire school has obtained a Certificate of Substantial Completion that meets the definition of 1.1.46.
- 1.1.6 Claims. A Claim is a request for payment, supported by back-up documentation which includes, invoices time sheets, or other documents substantiating legitimacy or entitlement that is submitted during the Project or immediately following the Project made prior to the Final Retention Payment Application and prior to Final Completion of the Project. A "Claim" means a separate demand by the Contractor for (1) time extension, (2) payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the CONTRACT and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (3) and amount the payment of which is disputed by the District. (See Article 4.6)

GENERAL CONDITIONS

- 1.1.7 Change Order (CO). A CO is a written instrument prepared by the Architect and signed by the District (as authorized by the District's Governing Board), the Contractor, and the Architect, stating their agreement upon (1) A description of a change in the Work, (2) The amount of the adjustment in the Contract Sum, if any; and (3) The extent of the adjustment in the Contract Time, if any. (See Article 7.2)
- 1.1.8 Change Order Request (COR). A COR is a written request supported by backup documentation prepared by the Contractor requesting that the District and the Architect issue a CO based upon a proposed change, or a change that results in an adjustment in cost, time or both, or arising from an RFP, CCD or ICD. (See Article 7.6)
- 1.1.9 Close-Out means the process for Final Completion of the Project, but also includes the requirements for the DSA Certification that the Project is Complete (See DSA Certification Guide). (See Article 9.9)
- 1.1.10 Construction Change Document (CCD). A Construction Change Document is a DSA term that is utilized to address changes to the DSA approved Plans and Specifications. There are two types of Construction Change Documents. (1) DSA approved CCD Category A for work affecting structural, access or fire/ life safety of the Project which will require a DSA approval; and, (2) CCD Category B for work NOT affecting structural safety, access compliance or fire/ life safety that will not require a DSA approval (except to confirm that no approval is required). Both CCD Category A and Category B shall be set forth in DSA Form 140 and submitted to DSA as required. (See Article 7.3)
- 1.1.11 Complete/ Completion/ Final Completion means that all Work in the Contract Documents is finished, the requirements of the Contract Documents have been met, the Project has been Closed Out, and all Work has ceased on the Project. This may also be referred to as Final Completion. In most cases, the recording of a Notice of Completion shall represent Completion of the Project. Beneficial Occupancy does not mean the Work is Complete.
- 1.1.12 Completion Date is the date when all Work for the Project shall be Substantially Complete and is the date assigned at the end of the Contract Time for the Project. (See Article 1.1.46)
- 1.1.13 Construction Manager. The Construction Manager is a consultant to the District contracted to assist in Project planning, management and construction of the Project. If there is a Construction Manager, they may assist in various aspects of the Project including, but not limited to Monitoring the progress of the construction, reviewing and monitoring the schedule, progress of work, monitoring pay requests, facilitating communications, advising the District and its Board of Education on various aspects of the construction process, monitoring the RFI, COR, CCD, ICD, RFP, Claims, Disputes and other Project related processes.
- 1.1.14 Contract or Agreement when the terms are used in these General Conditions shall be references to the Contract Documents as defined herein.
- 1.1.15 Contract Documents (sometimes referred to as Construction Documents) consist of the Agreement between District and Contractor (hereinafter the Agreement or Contract),

GENERAL CONDITIONS

Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to bid, instructions to bidders, notice to bidders, and the requirements contained in the Bid Documents, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is a written amendment to the Contract signed by parties, a Change Order, a Construction Change Document, or a written order for a minor change in the Work issued by the Architect. The Contract Documents collectively form the Contract. The Contract represents the entire and integrated Agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Architect and Contractor, between the District and any Subcontractor or Sub-subcontractor, or between any persons or entities other than the District and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

- 1.1.16 Contract Time is the time period specified in the Contract Documents in which the Project shall be completed. This is sometimes referred to a Contract Duration, or "time in which the Contractor has to complete the Project". (See Article 8.1.1)
- 1.1.17 Contractor, District, and Architect are those mentioned as such in the Agreement. They are treated throughout the Contract Documents as if they are of singular number and neuter gender. Any reference to "Owner" shall mean "District" or Bonita Unified School District.
- 1.1.18 Cure is the act of remedying a material failure to perform under the terms of the Contract Documents during the time provided to correct Contractor's Default. Specific time periods are provided to Cure and Correct a Contractor Default under Article 14 and for a Partial Default under Article 2.2 as well as elsewhere in the Contract Documents.
- 1.1.19 Days mean calendar days unless otherwise specifically stated.
- 1.1.20 Default is a material breach of Contract. A Termination for Cause under Article 14 is a declaration of Default of the Contract and shall act as a demand upon the Surety to perform under the terms of the Performance Bond. Partial Defaults may also be tendered to the Surety at District's discretion. (See Article 2.2)
- 1.1.21 Dispute. A dispute is a disagreement on terms or conditions of the Project where the Contractor's opinion of the Project, Payment, Change Order or Request for Proposal differs from that of the District or Architect. A dispute only rises to the level of a claim once the dispute is assembled with back-up documentation and presented for evaluation. (See Article 4.6)
- 1.1.22 District Representative is the person designated by the District to represent the District during the Construction for the Project. This District Representative shall have the delegated authority as further defined in Article 1.1.2. This District Representative may be an employee of the District who may have the delegated authority as set forth in Article 1.1.3, and may also include Construction Managers. In some cases, the District and its Board may be assisted by a Construction Manager. When a Construction

GENERAL CONDITIONS

Manager is assisting the District, the Contractor, Architect, and Inspector shall have a primary contact with the District's Construction Manager who will advise the District.

- 1.1.23 Drawings/Plans are graphic and pictorial portions of the Contract Documents prepared for the Project and approved changes thereto, wherever located and whenever issued, showing the design, location, and scope of the Work, generally including Plans, elevations, sections, details, schedules, and diagrams as drawn or approved by the Architect. Sometimes Drawings will also be included in Addenda, Change Orders, and Specifications.
- 1.1.24 DSA is the Division of State Architect. DSA is the agency that provides design and construction oversight for K-12 Schools, Community Colleges, and State Funded Charter School Projects. DSA is the responsible agency for this Project and Contractor has submitted a bid for the Project since Contractor is familiar with Contractor's responsibilities under the DSA requirements more thoroughly set forth at Title 24 of the California Code of Regulations. Contractor agrees to abide by the jurisdiction of DSA and shall construct the Project to conform with the approved Plans, Specifications, Addenda, and Change Orders (inclusive of approved CCD's and ICD's issued by the District pending CCD approval). See DSA website.
- 1.1.25 Emergency shall be defined as a sudden, unexpected occurrence, involving a clear and imminent threat to the continuation of school classes, a critical path delay that will result in not being able to occupy the school when students arrive to use the facility, danger from the facility or from outside the facility, Act of God, or other action which requires immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services.
- 1.1.26 Float the total number of days an activity may be extended or delayed without delaying the Completion Date shown in the schedule. Float will fall into three categories: (1) Rain Days; (2) Governmental Delays; and, (3) Project Float. (See Article 8.1.4)
- 1.1.27 Immediate Change Directive. (ICD) A written order prepared by the Architect and signed by the District and the Architect, directing a change in the Work where the Work must proceed immediately and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. (See Article 7.3)
- 1.1.28 Inspector of Record (IOR)/ Project Inspector (PI) is the individual retained by the District in accordance with Title 24 of the California Code of Regulations and who will be assigned to the Project
- 1.1.29 Notice of Non-Compliance (DSA Form 154) is a document issued by the Inspector if there is a deviation from the DSA approved Plans, Specifications, and Change Orders. (See Article 7.1.2)
- 1.1.30 Payment Application or Certificate of Payment is the Contractor's certified representation of the actual level of Work performed on the Project. Payment Applications are sometimes also called "Certificate of Payment", "Request for Payment", "Payment Application", or similar terms, and shall follow the Schedule of Values that are approved by the Architect, Inspector and District. (See Article 9.3)

GENERAL CONDITIONS

- 1.1.31 Project is the complete construction of the Work performed in accordance with the Contract Documents.
- 1.1.32 Project Manual is the volume assembled for the Work which may include, without limitation, the bidding requirements, sample forms, Conditions of the Contract, and Specifications.
- 1.1.33 Provide shall include “provide complete in place,” that is “furnish and install complete.”
- 1.1.34 Punch List/ Punch Item/ Incomplete Punch Item is a list of minor repair items, prepared after the issuance of a Certificate of Substantial Completion, by the Inspector and Architect of Work required in order to complete the Contract Documents and ensure compliance with the DSA Approved Plans so the Project may be Closed Out. Issuance of the Retention Payment is dependent of the proper completion of the Punch List. (See Article 9.9)
- 1.1.34.1 *Contractor’s List of Punch Items* is a list of minor repair items the Contractor submits when the Contractor considers the Work Substantially Complete. Submission of this List of Incomplete Punch Items is the Contractor’s representation that the Project is Substantially Complete. (See Article 9.9.1.1)
- 1.1.35 Request for Information (RFI) is a written request prepared by the Contractor requesting the Architect to provide additional information necessary to clarify or amplify an item which the Contractor believes is not clearly shown or called for in the Drawings or Specifications, or to address problems which have arisen under field conditions. (See Article 7.4)
- 1.1.36 Request for Proposal (RFP) is a written request prepared by the Architect (and/or CM) requesting the Contractor to submit to an estimate of the effect of a proposed change on the Contract Price and (if applicable) the Contract Time. (See Article 7.5)
- 1.1.37 Safety Orders are those issued by any city, county, state or federal agency having jurisdiction over the Project.
- 1.1.38 Schedule is the Contractor’s view of the practical way in which the Work will be accomplished. In this Agreement there is a requirement for a Baseline Schedule and regular Schedule Updates that show all Work to be completed during the Contract Time and shall include all items listed under Article 8.3.2.9. See Article 8 of the General Conditions.
- 1.1.39 Schedule of Values is a detailed breakdown of the Contract Price for each Project, building, Phase of Work or Site as determined by the District. This Schedule of Values shall adequately detail the price for the Work so Progress Payments Applications can be meaningfully reviewed by the Inspector, Architect of Record, Engineer of Record, and District. (See Article 9.2)
- 1.1.40 Separate Contracts are Contracts that the District may have with other Contractors, vendors, suppliers, or entities to perform Work on the Project. This may include, but is not limited to Multi-Prime Trade Contractors, furniture installers, testing agencies,

GENERAL CONDITIONS

clean-up contractors, or network or low voltage contractors. Contractor shall plan for certain other contractors that may also be working on the Project site and address these other contractors in Contractor's Schedule. (See Article 6)

- 1.1.41 Site refers to the grounds of the Project as defined in the Contract Documents and such adjacent lands as may be directly affected by the performance of the Work.
- 1.1.42 Specifications are that portion of the Contract Documents consisting of the written requirements for material, equipment, construction systems, instructions, quality assurance standards, workmanship, and performance of related services.
- 1.1.43 Standards, Rules, and Regulations referred to are recognized printed standards and shall be considered as one and a part of these Specifications within limits specified. Federal, state and local regulations are incorporated into the Contract Documents by reference.
- 1.1.44 Stop Work Order, or an Order to Comply, is issued when either (1) the Work proceeds without DSA approval; (2) the Work proceeds without a DSA Inspector of Record, or (3) where DSA determines that the Work is not being performed in accordance with applicable rules and regulations, and would compromise the structural integrity of the Project or would endanger lives. If a Stop Work Order is issued, the Work in the affected area shall cease until DSA withdraws the Stop Work Order. Pursuant to Education Code section 17307.5(b), the District shall not be held liable in any action filed against the District for any delays caused by compliance with the Stop Work Order
- 1.1.45 Subcontractor, as used herein, includes those having direct or indirect contracts with Contractor and ones who furnished labor, material or services for a special design according to Plans, Drawings, and Specifications of this Work.
- 1.1.46 Substantial Completion/ Substantially Complete(d) is not reached unless and until each of the following four (4) conditions have been met: (1) all contractually required items have been installed with the exception of only minor and Incomplete Punch List Items (See Article 9.9.1.2); (2) All Fire/Life Safety Systems have been installed, and are working and signed off on the DSA Form 152 Inspection Card, and all building systems including mechanical, electrical and plumbing are all functioning; (3) all other items DSA Form 152 Inspection Card for the Project have been approved and signed off; and (4) the Project is fit for occupancy and its intended use. For the purposes of this Contract, any references to Completion Date means Substantial Completion Date.
- 1.1.47 Substitution is a change in product, material, equipment, or method of construction from those required by the Construction Documents proposed by the Contractor. For this Project, a Substitution is subject to the filing of a Construction Substitution Request Form at the time of bid and meeting the requirements of Article 3.10.
- 1.1.48 Supplementary Conditions/ Supplementary General Conditions/ Special Conditions are terms that are sometimes used interchangeably and refer to any additional requirements or changes to the General Conditions as noted.
- 1.1.49 Surety is the person, firm, or corporation that executes as a bid bond, Payment Bond or Performance Bond guarantor on the Contractor's Bid, Contractor's Performance on the Contract and Payment of the Contractor's Subcontractors, material suppliers, vendors

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and labor on the Project. The Surety is bound to the same extent as the Contractor is bound once a Default occurs. A default includes a Termination for Substantial Failure to Perform under Article 14, but also includes any breach of Contract and is subject to the requirements and responsibilities as set forth in the Performance Bond.

1.1.50 Work shall include all labor, materials, services and equipment necessary for the Contractor to fulfill all of its obligations pursuant to the Contract Documents. It shall include the initial obligation of any Contractor or Subcontractor who performs any portion of the Work, to visit the Site of the proposed Work (a continuing obligation after the commencement of the Work), to fully acquaint and familiarize itself with the conditions as they exist and the character of the operations to be carried out under the Contract Documents, and make such investigation as it may see fit so that it shall fully understand the facilities, physical conditions, and restrictions attending the Work under the Contract Documents. Each such Contractor and its Subcontractors shall also thoroughly examine and become familiar with the Drawings, Specifications, and associated Contract Documents and bid documents before preparing and submitting any bid.

1.1.51 Workers include laborers, workers, and mechanics.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 Correlation and Intent

1.2.1.1 *Documents Complementary and Inclusive.* The Contract Documents are complementary and are intended to include all items required for the proper execution and completion of the Work. All Contract Documents form the Contractor's Contract with the District. Any item of Work mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be provided by Contractor as if shown or mentioned in both. The Contractor is bound to provide the Work complete and is under a legal duty to carefully study Plans and schedule operations well ahead of time and identify inconsistencies with the Plans and Specifications and call such inconsistencies to the attention of the Architect or Registered Engineer through the Inspector under Section 4-343(b) of Title 24.

1.2.1.2 *Work to be Complete.* Contractor has thoroughly studied the Contract Documents and understands that the District contracted with Contractor to provide a complete Project which means complete systems and buildings. The entire set of Contract Documents shows a complete Project and Contractor agrees that there are multiple disciplines putting together a set of Contract Documents. Thus, if portions of a system are shown on some Drawings and not others, this does not mean the Contractor is to only provide part of a system. For example, if an air conditioning unit is shown on the mechanical Drawings, the plumbing for the air conditioning is shown on another Drawing, and the electrical shown on the electrical Drawings, the Contractor is to provide a complete and working air conditioning system. The only time when an item is supplied incomplete is if the system is shown specifically as incomplete since others will be completing the system. Work includes, but is not limited to

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materials, workmanship, and manufacture of fabrication of components for the Project.

- 1.2.1.3 *Coverage of the Drawings and Specifications.* The Drawings and Specifications generally describe the Work to be performed by Contractor. Generally, the Specifications describe Work which cannot be readily indicated on the Drawings and indicate types, qualities, and methods of installation of the various materials and equipment required for the Work. It is not intended to mention every item of Work in the Specifications, which can be adequately shown on the Drawings, or to show on the Drawings all items of Work described or required by the Specifications even if they are of such nature that they could have been shown. All materials or labor for Work, which is shown on either the Drawings or the Specifications (or is reasonably inferable therefrom as being necessary to complete the Work), shall be provided by the Contractor. The Contractor is responsible for the whole Project as contractually set forth as the Contract Documents. It is intended that the Work be of sound, quality construction, and the Contractor shall be responsible for the inclusion of adequate amounts to cover installation of all items indicated, described, or implied in the portion of the Work to be performed by them.
- 1.2.1.4 *Conflicts.* In the event there is a discrepancy between the various Contract Documents, it is intended that the more stringent, higher quality, and greater quantity of Work shall apply.
- 1.2.1.5 *Conformance with Laws.* Each and every provision of law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein, even if through mistake or otherwise any such provision is not inserted, or is not correctly inserted.

Before commencing any portion of the Work, Contractor shall check and review the Drawings and Specifications for such portion for conformance and compliance with all laws, ordinances, codes, rules and regulations of all governmental authorities and public and municipal utilities affecting the construction and operation of the physical plant of the Project, all quasi-governmental and other regulations affecting the construction and operation of the physical plant of the Project, and other special requirements, if any, designated in the Contract Documents. Such checking shall include review of Title 24 of the California Code of Regulations, California Building Code, local utility, local water connection, local grading and all other applicable agencies. In the event Contractor observes any violation of any law, ordinance, code, rule or regulation, or inconsistency with the Contract Documents, Contractor shall, within five (5) days, notify the Inspector, Architect and District in writing of same and shall ensure that any such violation or inconsistency shall be corrected in the manner provided hereunder prior to the construction of that portion of the Project. (See Title 24 Section 4-343)

The Contractor shall bear all expenses of correcting Work done contrary to said laws, ordinances, rules, and regulations if the Contractor performed same (1)

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without first consulting the Architect for further instructions regarding said Work or (2) disregarded the Architect's instructions regarding said Work.

1.2.1.6 *Ambiguity and Inconsistency.* Before commencing any portion of the Work, Contractor shall carefully examine all Drawings and Specifications and other information given to Contractor as to materials and methods of construction and other Project requirements. Prior to commencing any portion of the Work, Contractor shall notify Architect and District in writing of any perceived or alleged error, inconsistency, conflict, ambiguity, or lack of detail or explanation in the Drawings and Specifications in the manner provided herein. If the Contractor or its Subcontractors, material or equipment suppliers, or any of their officers, agents, and employees performs, permits, or causes the performance of any Work under the Contract Documents, which it knows or should have known to be in error, inconsistent, or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all costs arising therefrom including, without limitation, the cost of correction thereof without increase or adjustment to the Contract Price or the time for performance. Contractor shall maintain an adequate inspection system and perform personal observations and review work and pre-plan the project to ensure the Work performed under the Contract conforms to Contract requirements. Contractor shall maintain records of such review and observation to ensure strict compliance with the terms of the Contract.

1.2.1.7 *Typical Parts and Sections.* Whenever typical parts or sections of the Work are completely detailed on the Drawings, and other parts or sections which are of the same construction are shown in outline only, the complete or more detailed shall apply to the Work which is shown in outline.

1.2.1.8 *Dimensions.* Dimensions of Work shall not be determined by scale or rule. Figured dimensions shall be followed at all times. If figured dimensions are lacking on Drawings, Architect shall supply them on request. The Architect's decisions on matters relating to aesthetic effect will be final.

1.2.2 Addenda and Deferred Approvals

1.2.2.1 *Addenda* are the changes in Specifications, Drawings, Contract Documents, and Plans which have been authorized in writing by the District or Architect, and which alter, explain, or clarify the Contract Documents. Addenda shall govern over all other Contract Documents. Subsequent addenda issued shall govern over prior addenda unless otherwise specified in the addenda.

1.2.2.2 *Deferred Approvals.* Deferred Approvals are Submittals that are reviewed by the Architect (or Engineer of Record) and submitted to DSA for approval based on thorough detailing of manufacturer and Project specific design. See Article 3.9.1 and 3.9.3. The Deferred Approval item cannot be fully detailed on the originally approved Drawings or Specifications because of variations in product design and manufacture. Contract Documents which require Deferred Approval items are meant to be for illustration purposes only. Approval of Plans for such a portion of the Work may be deferred

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until the material suppliers and Subcontractors are selected. All Deferred Approvals are noted in the Plans and Specifications. Contractor is responsible for all Deferred Approval requirements set forth in the Contract Documents. Contractor is responsible to comply with all laws, building codes, Title 24 and regulations necessary to obtain all necessary approvals, including those required from the Division of the State Architect (“DSA”) and the State Fire Marshall. Contractor shall not be granted an extension of time for failure to plan, schedule for and obtain necessary approvals. Contractor shall Schedule all Deferred Approval items in the Baseline Schedule and Schedule Updates under Article 3.9.6

1.2.3 Specification Interpretation

- 1.2.3.1 *Titles.* The Specifications are separated into titled sections for convenience only and not to dictate or determine the trade or craft involved.
- 1.2.3.2 *As Shown, Etc.* Where “as shown,” “as indicated,” “as detailed,” or words of similar import are used, reference is made to the Drawings accompanying the Specifications unless otherwise stated. Where “as directed,” “as required,” “as permitted,” “as authorized,” “as accepted,” “as selected,” or words of similar import are used, the direction, requirement, permission, authorization, approval, acceptance, or selection by Architect is intended unless otherwise stated.
- 1.2.3.3 *General Conditions.* The General Conditions and Supplementary General Conditions are a part of the Contract Documents which further defines and refines the Contract entered between the Contractor and District.
- 1.2.3.4 *Abbreviations.* In the interest of brevity, the Specifications are written in an abbreviated form and may not include complete sentences. Omission of words or phrases such as “Contractor shall,” “shall be,” etc., are intentional. Nevertheless, the requirements of the Specifications are mandatory. Omitted words or phrases shall be supplied by inference in the same manner as they are when a “note” occurs on the Drawings. In the interest of brevity, the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.
- 1.2.3.5 *Plural.* Words in the singular shall include the plural whenever applicable or the context so indicates.
- 1.2.3.6 *Metric.* The Specifications may indicate metric units of measurement as a supplement to U.S. customary units. When indicated thus: 1” (25 mm), the U. S. customary unit is specific, and the metric unit is nonspecific. When not shown with parentheses, the unit is specific. The metric units correspond to the “International System of Units” (SI) and generally follow ASTM E 380, “Standard for Metric Practice.”

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- 1.2.3.7 *Standard Specifications.* Any reference to standard specifications of any society, institute, association, or governmental authority is a reference to the organization's standard specifications, which are in effect at the date of the Contractor's proposal unless directed otherwise. If applicable specifications are revised prior to completion of any part of the Work, the Contractor may, if acceptable to Architect, perform such Work in accordance with the revised specifications. The standard specifications, except as modified in the Specifications for the Project, shall have full force and effect as though printed in the Specifications. Architect will furnish, upon request, information as to how copies of the standard specifications referred to may be obtained.

1.2.4 Rules of Document Interpretation

- 1.2.4.1 In the event of conflict within the Drawings, the following rules shall apply:

- a. General Notes, when identified as such, shall be incorporated into other portions of Drawings.
- b. Schedules, when identified as such, are complementary with other notes and other portions of Drawings including those identified as General Notes.
- c. Larger scale Drawings shall take precedence over smaller scale Drawings.
- d. At no time shall the Contractor base construction on scaled Drawings.

- 1.2.4.2 Specifications shall govern as to materials, workmanship, and installation procedures.

- 1.2.4.3 If Contractor observes that Drawings and Specifications are in conflict, Contractor shall, prior to commencing work, notify the Architect in writing for the purposes of obtaining an interpretation of the Contract Documents.

- 1.2.4.4 In the case of conflict or inconsistencies, the order of precedence shall be as follows:

- a. General Conditions take precedence over Drawings and Specifications.
- b. Supplemental Conditions take precedence over General Conditions.
- c. The Agreement Form shall take precedence over the Supplemental Conditions.
- d. In the case of disagreement or conflict between or within Specifications, and Drawings, the more stringent, higher quality, and greater quantity of Work shall apply.
- e. Addenda shall take precedence over Drawings and Specifications.
- f. General Conditions shall take precedence over Addenda.

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- g. Drawings and Specifications take precedence over the Soils Report.

1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

The Drawings, Specifications, and other Contract Documents for the Project are the property of the District and/or Architect pursuant Contract requirements between the District and Architect. The Contractor may retain one Contract record set. Neither the Contractor nor any Subcontractor, or material or equipment supplier shall own or claim a Copyright in the Drawings, Specifications, and other documents prepared by the Architect. All copies except the Contractor's record set, shall be returned or properly accounted for upon completion of the Work. The Drawings, Specifications, and other documents prepared by the Architect, and copies thereof furnished to the Contractor are not to be used by the Contractor or any Subcontractor, Sub-subcontractor, or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work. The District and/or Architect hereby grants the Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers a limited license to use applicable portions of the Drawings, Specifications, and other documents prepared for the Project in the execution of their Work under the Contract Documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the District's property interest or other reserved right.

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ARTICLE 2 DISTRICT

2.1 INFORMATION AND SERVICES REQUIRED OF THE DISTRICT

2.1.1 Site Survey

The District will furnish, at its expense, a legal description of the Site and a land survey showing the boundaries of the Site. Contractor shall be responsible for all surveys regarding location of construction, grading and site work.

2.1.2 Soils

When required by the scope of the Project, the District will furnish, at its expense, the services of geotechnical engineers or consultants when reasonably required and deemed necessary by the Architect or as required by local or state codes. Such services, with written reports and appropriate written professional recommendations, may include test boring, test pits, soil bearing values, percolation tests, air and water pollution tests, and ground corrosion and resistivity tests, including necessary operations for determining subsoil, air, and water conditions.

2.1.3 Soils Report Part of the Contract Documents: Contractor Reliance

A soils investigation report has been obtained from test holes at the Site, and such report is incorporated into this Contract and made available for the Contractor's use in preparing its bid and Work under this Contract. Where the Plans and Specifications are more specific and provide more significant structure, systems, reinforcing, thicknesses, or construction methods, the Drawings shall control over the soils report. The soils report is available at the Architect's office for review and it is Contractor's responsibility to ensure that Contractor has reviewed the soils investigation report. Any information obtained from such report or any other information given on Drawings as to subsurface soil condition or to elevations of existing grades or elevations of underlying rock is approximate only. If, during the course of Work under this Contract, Contractor encounters subsurface conditions which differ materially from those indicated in the soils report, then Contractor shall notify the District within five (5) calendar days of discovery of the condition, and changes to the Contract Price may be made in accordance with Article 7 entitled "Changes in the Work." Contractor agrees that no claim against District will be made by Contractor for damages and hereby waives any rights to damages in the event the Contractor fails to notify District within the five-day period mentioned above.

WARNING: DISTRICT DOES NOT WARRANT THE SOILS AT THE PROJECT SITE. CONTRACTOR HAS REVIEWED AND IS FAMILIAR WITH THE REQUIREMENTS OF THE SOILS INVESTIGATION REPORT. CONTRACTOR UNDERSTANDS THAT PLANS, DRAWINGS AND SPECIFICATIONS SUPERSEDE THE SOILS REPORT IF THERE ARE CONFLICTS. FURTHER, IN ADDITION TO THE INFORMATION IN THE SOILS REPORT, CONTRACTOR HAS CONDUCTED AN INDEPENDENT INVESTIGATION OF THE PROJECT SITE AND THE SOILS CONDITIONS OF THE SITE. DISTRICT DOES NOT WARRANT THE SOILS CONDITIONS OF THE SITE AND

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CONTRACTOR IS FULLY RESPONSIBLE TO ASCERTAIN SITE CONDITIONS FOR THE PURPOSES OF DETERMINING CONSTRUCTION MEANS AND METHODS PRIOR TO COMMENCING CONSTRUCTION.

2.1.4 Utilities

2.1.4.1 *Location of Point of Connection.* The locations shown for the point of connection are approximate. It shall be the responsibility of the Contractor to determine the exact location of all service connections.

2.1.4.2 *Regional Notification Center.* Contractor, except in an emergency, shall contact the appropriate regional notification center at least two (2) business days prior to commencing any excavation if the excavation will be conducted in an area or in a private easement which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the District, and obtain an inquiry identification number from that notification center. See Government Code section 4216.3. No excavation shall be commenced and carried out by the Contractor unless such an inquiry identification number has been assigned to the Contractor or any Subcontractor of the Contractor and the District has been given the identification number by the Contractor. Any damages arising from failure to make appropriate regional notification shall be at the sole risk of Contractor. Contractor shall solely be responsible for any fines, penalties or damages for violation of this Article and Government Code section 4216.6 or 4216.7. Any delays caused by failure to make appropriate regional notification shall be at the sole risk of Contractor and shall not be considered for extension of time pursuant to Article 8.4.

2.1.4.3 *Utilities - Removal and Restoration.* The District has endeavored to determine the existence of utilities at the Site of the Work from the records of the District of known utilities in the vicinity of the Work. The positions of these utilities as derived from such records are shown in the Contract Documents. Thus, the locations of the main or trunklines located on the Drawings are approximate locations and not exact.

No excavations were made to verify the locations shown for underground utilities. Other than the main or trunkline, which the District has endeavored to locate on the Plans, service connections or laterals to these utilities may not be shown on the Plans. It shall be the responsibility of the Contractor to determine the exact location of all service connections. The Contractor shall make its own investigations, including exploratory excavations, to determine the locations and type of service connections, prior to commencing work which could result in damage to such utilities. The Contractor shall immediately notify the District's representative as to any utility main or trunkline discovered by Contractor in a different position than provided by the Regional Notification Center. With respect to main or trunklines, Contractor is to immediately notify District if the location is substantially different than as shown in the Contract Documents.

Contractor shall coordinate its Work with all utilities, including, but not limited to electricity, water, gas and telephone and meet with said utilities prior to the start of any work. Contractor shall show timing of all utility coordination activities under the Scheduling requirements of Article 8.

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- 2.1.4.4 *Other Utilities.* In case it should be necessary to remove, relocate, or temporarily maintain a utility because of interference with the Work, the work on the utility shall be performed and paid for as follows:

When it is necessary to remove, relocate or temporarily maintain a service connection, the cost of which is not required to be borne by the owner of the service connection, the Contractor shall bear all expenses incidental to the work on the service connection. The work on the service connection shall be done in a manner satisfactory to the owner thereof; it being understood that the owner of the service connection has the option of doing such work with his own forces or permitting the work to be done by the Contractor.

When it is necessary to remove, relocate, or temporarily maintain a utility which is in the position shown on the Plans, the cost of which is not required to be borne by the owner thereof, the Contractor shall bear all expenses incidental to the work on the utility. The work on the utility shall be done in a manner satisfactory to the owner thereof; it being understood that the owner of the utility has the option of doing such work with his own forces or permitting the work to be done by the Contractor.

When it is necessary to remove, relocate, or temporarily maintain a utility which is not shown on the Plans or is in a position different from that shown on the Plans and were it in the position shown on the Plans would not need to be removed, relocated, or temporarily maintained, and the cost of which is not required to be borne by the owner thereof, the District will make arrangements with the owner of the utility for such work to be done at no cost to the Contractor, or will require the Contractor to do such work in accordance with Article 7 or will make changes in the alignment and grade of the Work to obviate the necessity to remove, relocate, or temporarily maintain the utility. Changes in alignment and grade will be ordered in accordance with Article 7 herein.

No representations are made that the obligations to move or temporarily maintain any utility and to pay the cost thereof is or is not required to be borne by the owner of such utility, and it shall be the responsibility of the Contractor to investigate to find out whether said cost is required to be borne by the owner of the utility.

The right is reserved to governmental agencies and to owners of utilities to enter at any time upon any street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work and for the purpose of maintaining and making repairs to their property.

2.1.5 Existing Utility Lines; Removal, Relocation

- 2.1.5.1 *Main or Trunkline Facilities.* If the Contractor while performing the Contract discovers utility facilities not identified in the Contract Documents, Contractor shall notify the District and utility in writing prior to commencing work.

The owner of the public utility shall have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation work at a reasonable price.

The Contractor shall exercise reasonable care and shall be compensated by the District for the actual verified field costs of locating, and removing, relocating, protecting or temporarily maintaining such main or trunkline utility facilities located in a substantially different location than in the Plans and Specifications, and for equipment in use on the project necessarily idled during such work. This Work shall be performed in accordance with Article 7 of these General Conditions.

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2.1.5.2 *Assessment.* Nothing in these subparagraphs shall be deemed to require the District to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the Site can be inferred from the presence of other visible facilities, such as buildings, or meter junction boxes on or adjacent to the Site and could be inferred from the Main or Trunkline shown on the Drawings.

2.1.5.3 *Notification.* If the Contractor, while performing Work under this Contract, discovers utility facilities not identified by the District in the Contract Documents. Contractor shall, within five (5) days, notify the District and the utility in writing. If Contractor fails to notify the District within forty eight hours after discovery of any utility facilities not identified by District in the Contract Documents, Contractor waives all rights to be compensated for any extra Work or damages resulting from such discovered utilities.

2.1.6 Easements

District shall secure and pay for easements for permanent structures or permanent changes in existing facilities, if any, unless otherwise specified in the Contract Documents.

2.2 **DISTRICT'S RIGHT TO CARRY OUT THE WORK DUE TO PARTIAL DEFAULT IN A SPECIFIC SEGREGATED AREA OF WORK (48 HOUR NOTICE TO CURE AND CORRECT)**

If the Contractor Defaults or neglects to carry out the Work in accordance with the Contract Documents, the District may provide forty-eight (48) hour written notice to cure (a shorter period of time in the case of Emergency or a critical path delay as defined in Article 2.2.1) Contractor's Partial Default in a specific segregated area of work. The District's right to issue a Partial Default of the Contractor's Work and take over that segregated area of Work includes, but is not limited to:

1. Failure to supply adequate workers on the entire Project or any part thereof;
2. Failure to supply a sufficient quantity of materials;
3. Failure to perform any provision of this Contract;
4. Failure to comply with safety requirements, or due to Contractor is creation of an unsafe condition;
5. Cases of bona fide emergency;
6. Failure to order materials in a timely manner;
7. Failure to prepare Deferred Approval items or Shop Drawings in a timely manner;
8. Failure to comply with Contractor's Baseline or Update Schedule, meet critical Milestones which would result in a delay to the critical path, or delay the Contract Time;

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9. Failure to comply with the Subletting and Subcontracting Fair Practices, Public Contract Code section 4100, et seq.
10. Failure to meet the requirements of the Americans with Disabilities Act;
11. Failure to complete Punch List work;
12. Failure to proceed on an Immediate Change Directive
13. Failure to correct a Notice of Deviation

If during the forty eight (48) hour period, the Contractor fails to Cure and correct the deficiency noted in the 48 hour notice of Partial Default with diligence and promptness, the District may correct such deficiencies without prejudice to other remedies the District may have, including a Termination for Cause as set forth in Article 14. If there are inadequate funds remaining the Project balance or in the Retention Escrow to address at least 150% of the costs set forth in the Article 2.2 notice, the District may copy the Surety on the written notice of Partial Default. If a notice to the Surety is provided, except in the cases of emergency or critical path delay, the Surety has the option to take over and complete the Work described in the written notice if Surety personally delivers notice to District that it intends to perform such work. In the case where written notice has been provided, the District shall allow Surety seven (7) days to perform the Work.

2.2.1 Service of Notice of Partial Default with Right to Cure

A written notice of Partial Default and right to cure under Article 2.2 (“Article 2.2 Notice” or “Notice of Partial Default”) shall be served by e-mail (with a copy provided by regular mail) to the e-mail address provided on the Bid submitted and copied to the Project Superintendent.

2.2.2 Shortened Time for Partial Default in the Case of Emergencies.

In an Emergency situation, the District may correct any of the deficiencies described in Article 2.2 without prejudice to other remedies by providing service of written notice of Emergency requiring a shortened time for Partial Default specifying the time given to cure, if any.

2.2.3 Shortened Time for Partial Default in the Case of Critical Path Delay

In the case of critical path delay, the District may correct any of the deficiencies described in Article 2.2 without prejudice to other remedies providing service of written notice of critical path delay to the Contractor with a specific description of the critical path delay items noting the line item or area of Work that is on the critical path and prescribe the length of shortened time to cure, if any.

2.2.4 Written Notice of Partial Default to be Deducted by Deductive Change Order

The District shall have the right to determine the reasonable value of the Article 2.2 Partial Default Work, or if there is an actual value for the Work, shall use that value and issue a Deductive Change Orders under Article 7.7.4

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ARTICLE 3 THE CONTRACTOR

3.1 SUPERVISION AND CONSTRUCTION PROCEDURES

3.1.1 Contractor

The Contractor shall continually supervise and direct the Work using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, procedures; and shall coordinate all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. The Contractor shall not perform the Work without utilizing the Contract Documents or, where required, approved Submittals, Shop Drawings, or samples for any such portion of the Work. If any of the Work is performed by contractors retained directly by the District, Contractor shall be responsible for the coordination and sequencing of the work of those other contractors so as to avoid any impact on the Project Schedule pursuant to the requirements of Article 6 and Article 8. Specific duties of the Contractor shall include those set out in Section 43 of Title 21 of the California Code of Regulations and Section 4-343 of Title 24 of the California Code of Regulations. These duties include, but are not limited to the following:

3.1.1.1 *Responsibilities.* It is the duty of the Contractor to complete the Work covered by his or her Contract in accordance with the approved Plans and Specifications. The Contractor in no way is relieved of any responsibility by the activities of the Architect, Engineer, Inspector or DSA in the performance of their duties.

3.1.1.2 *Performance of the Work.* The Contractor shall carefully study the approved Plans and Specifications and shall plan its schedule of operations well ahead of time. If at any time it is discovered that work is being done which is not in accordance with the approved Plans and Specifications, the Contractor shall correct the Work immediately.

3.1.2 Contractor Responsibility to Study the Plans and Specifications

All inconsistencies or timing or sequences which appear to be in error in the Plans and Specifications shall promptly be called to the attention of the Architect or, Engineer, for interpretation or correction. Local conditions which may affect the structure shall be brought to the Architect's attention at once. In no case, shall the instruction of the Architect be construed to cause work to be done which is not in conformity with the approved Plans, Specifications, change orders, construction change documents, and as required by law. (See Title 24, Section 4-343)

3.1.3 All Work Under the Direction of Inspector

Pursuant to Title 24 requirements, the Contractor shall not carry on Work except with the knowledge of the Inspector. (See Title 24 generally)

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3.1.4 Contractor to Establish Timing and Protocol with Inspector

Contractor shall establish a protocol for requesting inspection with Inspector so as to not delay the Work and provide adequate time for the Inspector to perform inspection. If such a protocol is not established ahead of time, Inspector may utilize the time criteria set by Title 24 of 48 hours in advance of submitting form DSA 156 for each new area. DSA requirements under PR 13-01 specifically gives the Special Inspector fourteen (14) days to post to the DSA website. Contractor is responsible for delays and for failure to plan.

For some Projects, there may be a need to incrementally install certain assemblies. It is up to Contractor to identify areas and assemblies that may be constructed incrementally. Contractor must identify and establish incremental areas of construction and establish protocols with Inspector for DSA 152 approvals so they may be presented to DSA. (See PR-13 item 1.17 for further discussion)

3.1.5 Verified Reports

The Contractor shall make and submit to the office from time to time, verified reports as required in Title 24 Section 4-366. As part of the Close-Out of the Project (see Article 9.9), Contractor shall be required to execute a Form 6-C as required under Title 24 Sections 4-343.

Contractor shall fully comply with any and all reporting requirements of Education Code sections 17315, et seq., in the manner prescribed by Title 24, as applicable.

3.1.6 Contractor Responsibility

The Contractor shall be responsible to the District for acts and omissions of the Contractor's employees, Subcontractors, material and equipment suppliers, and their agents, employees, invitees, and other persons performing portions of the Work under direct or indirect contract with the Contractor or any of its Subcontractors.

3.1.7 Obligations not Changed by Architect's Actions

The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract or by tests, inspections, or approvals required or performed by persons other than the Contractor.

3.1.8 Acceptance/Approval of Work

The Contractor shall be responsible to determine when any completed portions of the Work already performed under this Contract or provided pursuant to Article 6 are suitable to receive subsequent Work thereon.

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3.2 SUPERVISION

3.2.1 Full Time Supervision

Unless personally present on the Project site where the Work is being performed, the Contractor shall keep on the Work at all times during its progress a competent, English speaking construction Superintendent satisfactory to the District. The Superintendent shall be present on a full-time basis, shall be dedicated exclusively to the Project and shall not share superintendency duties with another project or job. The Superintendent shall not be replaced except with written consent of the District. The Superintendent shall represent the Contractor in its absence and shall be fully authorized to receive and fulfill any instruction from the Architect, the Inspector, the District or any other District Representative (including CM in the cases where the District has a CM representative). All Requests for Information shall be originated by the Superintendent and responses thereto shall be given to the Superintendent. No Work shall begin on any day by any Subcontractor or other person on the Project site until the Superintendent has arrived, or shall any Work continue during the day after the Superintendent has departed from the Project site. The Superintendent shall have authority to bind Contractor through the Superintendent's acts. The Superintendent shall represent the Contractor, and communications given to the Superintendent shall be binding on the Contractor. Before commencing the Work, Contractor shall give written notice to District (and CM representative) and Architect of the name and a Statement of Qualifications of such superintendent. Superintendent shall not be changed except with written consent of District, unless a superintendent proves to be unsatisfactory to Contractor and ceases to be in its employ, in which case, Contractor shall notify District and Architect in writing. Contractor shall provide a replacement superintendent approved by the District prior to performing additional work.

3.2.2 Staff

Notwithstanding other requirements of the Contract Documents, the Contractor and each Subcontractor shall: (1) furnish a competent and adequate staff as necessary for the proper administration, coordination, supervision, and superintendence of its portion of the Work; (2) organize the procurement of all materials and equipment so that the materials and equipment will be available at the time they are needed for the Work; and (3) keep an adequate force of skilled and fit workers on the job to complete the Work in accordance with all requirements of the Contract Documents.

3.2.3 Right to Remove

District shall have the right, but not the obligation, to require the removal from the Project of any superintendent, staff member, agent, or employee of any Contractor, Subcontractor, material or equipment supplier.

3.3 LABOR AND MATERIALS

3.3.1 Contractor to Provide

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, material, equipment, tools, construction equipment and machinery, water,

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heat, air conditioning, utilities, transportation, and other facilities, services and permits necessary for proper execution and completion of the Work whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.3.2 Quality

Unless otherwise specified, all materials and equipment to be permanently installed in the Project shall be new and shall be of the highest quality or as specifically stated in the Contract Documents. The Contractor shall, if requested, furnish satisfactory evidence as to kind and quality of all materials and equipment within ten (10) days of a written request by the District, including furnishing the District with bona fide copies of invoices for materials or services provided on the Project. All labor shall be performed by workers skilled in their respective trades, and shall be of the same or higher quality as with the standards of other school construction.

3.3.3 Replacement

Any work, materials, or equipment, which do not conform to these requirements or the standards set forth in the Contract Documents, may be disapproved by the District, in which case, they shall be removed and replaced by the Contractor at no additional cost or extension of time to the District.

3.3.4 Discipline

The Contractor shall enforce strict discipline and good order among the Contractor's and Subcontractor's employees, and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. As used in this subsection, "unfit" includes any person who the District concludes is improperly skilled for the task assigned to that person, who fails to comply with the requirements of this article, or who creates safety hazards which jeopardize other persons and/or property.

3.3.5 Fingerprinting (Applicable at the time Project is Occupied and on all Projects where Workers will come in Contact with Pupils, such as Modernization Projects)

If applicable, Contractor shall comply with the applicable provisions of Education Code section 45125.1 in a method as determined by the District. Pursuant to Education Code section 45125.1, Contractor shall either conduct criminal background checks of all employees of Contractor assigned to the Project site, and shall certify that no employees who have been convicted of serious or violent felonies, as specified in Education Code section 45125.1, will have contact with pupils, by utilizing the Certification Regarding Background Checks and the corresponding Attachment "A" as found in the Contract Documents or shall be separated by a physical barrier from students.

If it is determined that Contractor must provide certification of employees, as part of such certification, Contractor must provide the District with a list of all employees providing services pursuant to this Agreement, and designate which sites such employees will be assigned. In performing the services set forth in this Agreement, Contractor shall not utilize any employees who are not included on the above-referenced list.

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At District's sole discretion, District may make a finding, as authorized under Education Code section 45125.1, that Contractor's employees will have only "limited contact" with pupils. Contractor's failure to comply with this law shall be considered a material breach of this Agreement upon where this Agreement may be terminated, at District's sole discretion, without any further compensation to Contractor.

In the case of new construction Projects where there are no students, if the Project Schedule provides for Beneficial Occupancy or portions of the Project or if the Project should be delayed, then Contractor, at no additional costs, shall meet the requirements of either fingerprinting or providing a physical barrier as required by the District.

3.3.6 Noise, Drugs, Tobacco, and Alcohol

Contractor shall take all steps necessary to insure that employees of Contractor or any of its Subcontractors' employees do not use, consume, or work under the influence of any alcohol, tobacco or illegal drugs while on the Project. Contractor shall further prevent any of its employees or its Subcontractor employees from playing any recorded music devices or radios or wearing any radio headphone devices for entertainment while working on the Project. Likewise, Contractor shall prevent its employees or Subcontractor's employees from bringing any animal onto the Project. Contractors shall not violate any written school policies.

3.3.7 Delivery of Material

Contractor shall place orders for materials or equipment so that the Work may be completed in accordance with the Construction schedule for the Work as set forth in Article 8 of this Agreement. Contractor shall, upon demand from the Architect, furnish to the Architect documentary evidence including, but not limited to purchase orders, invoices, bills of materials, work orders and bills of lading, showing that orders have been placed. Contractor shall have a system to receive materials and to ensure that the proper materials are being delivered, including in the case of critical materials to the Project, checking the delivery against Shop Drawings and ensuring that the materials meet the requirements of not only the Plans and Specifications, but also the approved Shop Drawings and Submittals and in conformance with Contractor's plan for delivery of materials (including but not limited to Contractor's representations in the Schedules for the Project and Contractor's equipment and materials schedule under Article 3.7.2.2). Contractor shall be responsible for all costs of accepting non-conforming materials delivered to the Project given Contractor's responsibilities and system for acceptance of deliveries. Contractor shall notify Inspector and District Representative (including CM) as early as possible, in writing, of the delivery of materials for the Project. The deliveries shall include documentation identifying the shipment sufficiently so that the Inspector, Architect or District Representative (including CM) may review the materials that are received. Under no circumstances shall materials be delivered to the Project site that are meant for another Project.

3.3.8 Liens and Other Security Interests of Subcontractors and Material Suppliers

No material, supplies, or equipment for the Work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by seller or supplier. Contractor warrants good title to all

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material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver premises, together with all improvements and appurtenances constructed or placed thereon by it, to District free from any claims, security interests, liens, or charges. Contractor further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any Work covered by this Contract shall have any right to place a lien upon the premises or any improvement or appurtenance thereof, except that Contractor may install metering devices or other equipment of a utility company or political subdivision, title to which is commonly retained by the utility company or political subdivision. In event of installation of any such metering device or equipment, Contractor shall advise District as to its owner within five (5) days of such installation in writing, prior to making the installation.

Contractor agrees to indemnify, defend and hold the District harmless from any liens, stop notices, or assertion of security interests, including judgments and levies. If after written notice Contractor fails to address the lien, stop notice, or other security interest, the District may proceed to address the lien, stop notice or claim and seek reimbursement from Contractor.

3.3.9 Title to Materials

The title to new materials or equipment for the Work of this Contract shall remain with Contractor until incorporated in the Work of this Contract until final acceptance of the Project; no part of said materials shall be removed from its place of storage, and Contractor shall keep an accurate inventory of all said materials and equipment in a manner satisfactory to the District or its authorized representative. Responsibility for materials remains with Contractor and Contractor shall replace materials in case of loss. District similarly may pay for materials stored off site, but Contractor shall remain responsible for the materials that are stored off site.

3.3.10 Assemblies

For all material and equipment specified or indicated in the Drawings, the Contractor shall provide all labor, materials, equipment, and services necessary, (including engineering as specifically required with Shop Drawings or Deferred Approvals) for complete assemblies and complete working systems. Incidental items not indicated on the Drawings, nor mentioned in the Specifications, that can legitimately and reasonably be inferred to belong to the Work described, or be necessary in good practice to provide a complete assembly or system, shall be furnished as though itemized in the Contract Documents in every detail. In all instances, material and equipment shall be installed in strict accordance with each manufacturer's most recent published recommendations and Specifications.

3.3.11 Noise Control

The Contractor shall be responsible for the installation of noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction equipment noise is subject to the control of the Environmental Protection Agency's Noise Control Program (Part 204 of Title 40, Code of Federal Regulations). If school is in session at any point during the progress of the Project, and, in the District's reasonable discretion, the noise from such Work disrupts or disturbs the

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students or faculty or the normal operation of the school, at the District's request, the Contractor shall schedule the performance of all such Work around normal school hours or make other arrangements so that the Work does not cause such disruption or disturbance. There are specific periods of testing at operational schools and it is critical that Contractor control noise during periods of testing. In no event shall Contractor have a right to receive additional compensation or an extension to the Contract time as a result of any such rescheduling or the making of such arrangements. These controls shall be implemented during site preparation and construction. All noise related issues, including school operations, and noise during testing should be detailed in the Schedule provided pursuant to Article 8

3.4 WARRANTY

The Contractor warrants to the District and Architect that material and equipment furnished under the Contract will be of the highest quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. Contractor's warranty to District includes, but is not limited to, the following representations:

- 3.4.1 In addition to any other warranties provided elsewhere, Contractor shall, and hereby does, warrant all Work after the date of Notice of Completion of Work by District and shall repair or replace any or all such Work, together with any other Work, which may be displaced in so doing that may prove defective in workmanship or materials within a one (1) year period from date of Final Completion which shall be no later than the final date of Punch List as noted at Article 9.11) without expense whatsoever to District, ordinary wear and tear, unusual abuse or neglect excepted. District will give notice of observed defects with reasonable promptness. Contractor shall notify District upon completion of repairs.
- 3.4.2 In the event of failure of Contractor to comply with above mentioned conditions within one week after being notified in writing, District is hereby authorized to proceed to have defects repaired and made good at expense of Contractor who hereby agrees to pay costs and charges therefore immediately on demand.
- 3.4.3 If, in the opinion of the District, defective Work creates a dangerous condition or requires immediate correction or attention to prevent further loss to the District, the District will attempt to give the notice required by this Article. If the Contractor cannot be contacted or does not comply with the District's requirements for correction within a reasonable time as determined by the District, the District may, notwithstanding the provisions of this article, proceed to make such correction or attention which shall be charged against Contractor. Such action by the District will not relieve the Contractor of the guarantee provided in this Article or elsewhere in this Contract.
- 3.4.4 This Article does not in any way limit the guarantee on any items for which a longer warranty is specified or on any items for which a manufacturer gives a guarantee for a longer period. Contractor shall furnish District all appropriate guarantee or warranty certificates upon completion of the project.

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3.5 TAXES

Contractor will pay all applicable Federal, State, and local taxes on all materials, labor, or services furnished by it, and all taxes arising out of its operations under the Contract Documents. District is exempt from Federal Excise Tax, and a Certificate of Exemption shall be provided upon request.

3.6 PERMITS, FEES AND NOTICES

3.6.1 Payment

The Contractor shall secure and pay for all permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are necessary after execution of the Contract and are legally required by any authority having jurisdiction over the Project, except those required by the Division of the State Architect (DSA). District shall be responsible for all testing and inspection as required by the DSA on-site or within the distance limitations set forth in Article 13.5.2, unless a different mileage range is specified in the Supplemental Conditions.

3.6.1.1 *DSA Fees.* DSA policy is to charge CCD review fees for processing and approval of changes in the Plans and Specifications through the Construction Change Document process. Contractor is specifically directed to the current DSA IR A-30 which provides fee structure and charges that will be incurred for proceeding with respect to the CCD process, a process that must be followed for each change in the Plans and Specifications.

3.6.2 Compliance

The Contractor shall comply with and give notices required by any law, ordinance, rule, regulation, and lawful order of public authorities bearing on performance of the Work. Specifically, the Division of State Architect provides State oversight of the Project and enforcement of Title 24 rules and regulations. Contractor is directed to the DSA website. There will be local governmental oversight from City, County or both. Finally, Regional Water Quality Control Board, State Fire Marshall, local fire marshal, Department of Industrial Relations, Department of Labor Standards Enforcement, and Air Quality Management District (Local and State) are some of the agencies that provide oversight and may require specific permits, fees, or provide oversight over the Project. Contractor represents understanding and specialized knowledge of the rules governing school districts and Contractor shall maintain compliance over the applicable rules and will file all documents required in order to ensure compliance with State, local, and other rules that apply to the Project.

3.6.3 Responsibility

The Contractor shall perform all Work in conformance with every law, statute, ordinance, building code, rule or regulation. The Contractor shall assume full responsibility for such Work and shall bear the attributable cost of correction or project delay.

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Pursuant to Title 24 Section 4-343(b):

“Contractor shall carefully study the approved Plans and Specifications and shall plan a schedule of operations well ahead of time.... All inconsistencies or items which appear to be in error in the Plans and Specifications shall be promptly called to the attention of the architect or registered engineer, through the inspector, for interpretation or correction.”

To help Contractor plan its operations, Contractor is directed to study the current version of the DSA 152 Inspection Card Manual identifying the exact steps the Inspector is to follow in the review and sign off process for the DSA 152. The DSA 152 Inspection Card Manual provides specific detail as to the order of operations, review items and compliance items beyond the Specifications and Plans which are reviewed for DSA compliance. The most current version of this manual is located on DSA’s website.

Contractor is also specifically directed to the time periods for posting of Special Inspection Reports and Inspector Notifications under DSA PR 13-01 since the timing of Inspection is not a Governmental Entity related delay.

3.7 SUBMITTALS REQUIRED AT THE COMMENCEMENT OF THE PROJECT

3.7.1 Requirements Within Ten (10) Calendar Days

Within ten (10) calendar days after Notice to Proceed, Contractor shall submit the following:

- 3.7.1.1 Detailed Schedule of Values (See Article 9.2)
- 3.7.1.2 Submittal Listing and Schedule for Submittals
- 3.7.1.3 Critical Path Baseline Schedule (See Article 8)

3.7.2 Requirements Within Thirty-Five (35) Calendar Days

Within thirty-five (35) calendar days after Notice to Proceed, Contractor shall submit the following:

- 3.7.2.1 *All Submittals for the Project* except those specifically agreed upon by District and Architect, in writing, and shall be specifically incorporated into the Submittal section of the Schedule so as to not delay the Work. The agreement to allow a later Submittal does not mean that Article 3.3.7 is waived. Contractor shall order materials and ensure prices are honored and secured for the Project.
 - a. Structural Steel may be included as a later Submittal than 35 days if Structural Steel is a significant portion of the Work, at least one or some of the Project is a structural steel structural system, or as specifically agreed upon by the Architect or District.
 - b. It is specifically agreed that submissions of structural steel Submittals shall not be piecemeal (unless some portion is requested separately by the

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District or Architect), shall provide complete designs, shall be stamped by the structural steel Subcontractor, Contractor, and structural steel Subcontractor's structural engineer at time of submission and as further addressed in Article 3.9.

- c. In no case shall the submission of structural steel Drawings delay the critical path for the schedule. If a Milestone is provided for submission of complete structural steel Shop Drawings then the date shall be no later than as set forth in the Milestone

3.7.2.2 *Exceptions to Submittal Within Thirty-Five (35) Days by Written Agreement.* A written request detailing the specific reasons for a submission later than 35 days due to complexity of design or non-critical path status of the Submittal shall be submitted at the time the Baseline Schedule is submitted. The Baseline Schedule shall not include a delayed Submittal until written agreement is provided. In addition to the request for providing a Submittal after the thirty-five (35) day period, a copy of the Contract with the Subcontractor who shall be performing the Submittal, a written statement from the Subcontractor verifying that work has commenced on the Submittal and providing Subcontractor's own schedule of Milestones and completion dates, and a corresponding Submittal designation in the Schedule as required under Article 8. Approval of a delayed Submittal shall not result in any increase in the Contract Price or result in an extension of time for the completion of the Project.

3.7.2.3 *Piecemeal Submissions of Submittals.* Piecemeal Submittals mean providing portions of Shop Drawings or Submittals as they are being completed. The submission of piecemeal Submittals results in the appearance of a submission when there is inadequate information for the Architect or Engineer to adequately review a submission. Piecemeal differs from submission of complete buildings or phases of buildings or complete assemblies. The Architect may agree to allow submission of single buildings or areas as long as the Submittals are complete. .

3.8 DOCUMENTS, SAMPLES, AND COMPUTER AT THE SITE

The Contractor shall maintain at the Site for the District one current copy of the California Building Code, Titles 19 and 24 of the California Code of Regulations, any other document required by DSA, and one record copy of the Drawings, Specifications, Addenda, Change Orders, and other Modifications, in good order and marked currently to record changes and selections made during construction. In addition, the Contractor shall maintain at the Site approved Shop Drawings, Product Data, Samples, and similar required Submittals. These documents shall be available to the Architect and shall be delivered to the Architect for delivery to the District upon completion of the Work.

Contractor shall have an operational computer with internet access so Contractor can review and post documents as required for the Project, including but not limited to the filing and posting of DSA required documents for the Project.

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Contractor shall be prepared to review documents posted to the DSA Project website.

3.9 SUBMITTALS INCLUDING SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

3.9.1 Definitions

- 3.9.1.1 *Deferred Approvals.* Approval of certain aspects of the construction may be deferred until the construction Contract has been awarded. To facilitate the design process, DSA grants Deferred Approval to the design and detailing of certain elements of the Project at the request of the Architect or Engineer of Record. Design elements that may be deferred may include, but are not limited to access floors, bleachers, elevator guide rails and related elevator systems, exterior wall systems - precast concrete, glass fiber reinforced concrete, etc., skylights, window wall systems, storefronts, stage rigging, and other systems as noted in the Contract Documents. (Also see Article 1.2.2.2 and 3.9.3)
- 3.9.1.2 *Shop Drawings.* The term “Shop Drawings” as used herein means Drawings, diagrams, equipment or product schedules, and other data, which are prepared by Contractor, Subcontractors, manufacturers, suppliers, or distributors illustrating some portion of the Work, and includes: illustrations; fabrication, erection, layout and setting Drawings; manufacturer’s standard Drawings; schedules; descriptive literature, instructions, catalogs, and brochures; performance and test data including charts; wiring and control diagrams; and all other Drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment, or systems and their position conform to the requirements of the Contract Documents.
- 3.9.1.3 *Manufactured* applies to standard units usually mass-produced, and “Fabricated” means items specifically assembled or made out of selected materials to meet individual design requirements. Shop Drawings shall: establish the actual detail of all manufactured or Fabricated items, indicate proper relation to adjoining work, amplify design details of mechanical and electrical systems and equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions.
- 3.9.1.4 *Submittals* is a term used interchangeably and sometimes refers to Shop Drawings, Product Data, and samples since all Subcontractor submissions are tracked in a Submittal Log and may include any of the noted items. However, generally, a Submittal is a manufacturer’s product information and Product Data including description, characteristics, size, physical characteristics, and requirements to prepare the jobsite for receiving of the particular manufactured item.
- 3.9.1.5 *Samples.* The term “samples” as used herein are physical examples furnished by Contractor to illustrate materials, equipment, or quality and includes natural materials, Fabricated items, equipment, devices,

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appliances, or parts thereof as called for in the Specifications, and any other samples as may be required by the Architect to determine whether the kind, quality, construction, finish, color, and other characteristics of the materials, etc., proposed by the Contractor conform to the required characteristics of the various parts of the Work. All Work shall be in accordance with the approved samples.

3.9.2 Shop Drawings.

- 3.9.2.1 *When Shop Drawings Are Required.* Shop Drawings are required for prefabricated components and for installation and coordination of these prefabricated components into the Project. In addition, Shop Drawings, are prepared to address the actual size and installation of components from various Subcontractors and provides an opportunity for the Contractor to coordinate and address conflicts between the subcontracting trades. In some cases, each Subcontractor or trade will provide Shop Drawings in a BIM format or other format as agreed by District.
- 3.9.2.2 *Purpose for Shop Drawings.* Shop Drawings are the Contractor's manufacturer, Subcontractor, supplier, vendor or the Contractor's detailed drawings showing particularized method for assembly, specifics to a manufacturer, manufacturer component installation requirements, specifics as to a manufactured item, alterations to a manufactured, a custom created item, or drawn version of more detailed information expanding on the Architect's design shown in the Contract Documents. The Shop Drawings address the appearance, performance, size, weight, characteristics and prescriptive descriptions associated with the Contractor or Contractor's Subcontractor's plan for installation or assembly based on the design in the Specifications and Contract Documents. The Shop Drawing often is more detailed than the information shown in the Contract Documents to give the Architect and Engineer the opportunity to review the fabricator's version of the product (along with particulars specific to that particular product), prior to fabrication. References to the Contract Documents, Construction Documents, Drawings, Plans, and Specifications assist the Architect and Engineer in their review of the Shop Drawings. Attachment of manufacturer's material Specifications, "catalog cut sheets," and other manufacturer's information may be provided to accompany Shop Drawings. Because Shop Drawings facilitate the Architect's and Engineer's approval of the system, they should be as clear and complete as possible so they may be reviewed by Architect or Engineer for the Project.
- 3.9.2.3 *Shop Drawing Requirements.* The Contractor shall obtain and submit with Shop Drawings all seismic and other calculations and all Product Data from equipment manufacturers. "Product Data" as used herein are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.
- 3.9.2.4 *Not a Reproduction of Architectural or Engineering Drawings.* The Shop Drawings are not a reproduction of the architectural or engineering

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Drawings. Instead, they must show more detail than the Construction Documents and details the fabrication and/or installation of the items to the manufacturer's production crew or Contractor's installation crews.

- 3.9.2.5 *Shop Drawings Engineering Requirements:* Some Shop Drawings require an engineer stamp to be affixed on the Drawings and calculations. In such cases, a current and valid engineering stamp shall be affixed by a California registered engineer. No out of State engineers shall stamp Shop Drawings. (See DSA IR A-18). In most cases, an engineer means California registered mechanical, structural, electrical or plumbing engineer. California Registered Civil Engineers will not be accepted for structural details unless specifically approved by DSA.
- 3.9.2.6 *DSA Approvals Required Prior to Work.* No work on a Shop Drawing that requires DSA approval may proceed until DSA approval is received. Contractor has provided DSA approval time and allowed adequate time for corrections in Contractor's Schedule as required pursuant to Article 8.
- 3.9.2.7 *Shop Drawing Identification.* All Shop Drawings must be properly identified with the name of the Project and dated, and accompanied by a letter of transmittal referring to the name of the Project and to the Specification section number for identification of each item clearly stating in narrative form, as well as "clouding" all qualifications, departures, or deviations from the Contract Documents. Shop Drawings, for each section of the Work shall be numbered consecutively and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each drawing shall have a clear space for the stamps of Architect and Contractor.

3.9.3 Deferred Approvals

Deferred approvals shall be submitted and processed to ensure all DSA and other governmental approvals are secured so as to not delay the Project. There may be additional requirements for Deferred Approvals at Division 1 of the Specifications. All Deferred Approvals shall be prepared by Contractor or Contractor's agent early enough so as to not delay the Project. Contractor is aware that Title 24 California Code of Regulations Section 4-317 have specific requirements for Deferred Approval as to governing agencies and as to the Architect and Engineer for the Project. As a result, any delay associated with the time for approval by applicable agencies or by the Architect or Architect's consultants shall be Contractor's. Contractor is required to comply with inclusion of Deferred Approvals in the Schedule as required under Article 3.9.6*DSA Approvals Required Prior to Work.* No work on a Deferred Approval item may proceed on the components until DSA approval is received. Contractor has provided DSA approval time and allowed adequate time for any DSA revisions in Contractor's Schedule as required pursuant to Article 8.

3.9.4 Submittals and Samples

- 3.9.4.1 *Information Required With Submittals:* Manufacturer, trade name, model or type number and quantities: Information provided must be of sufficient detail to allow Architect and Engineer to compare the submitted item with

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the specified products and acceptable products listed, in the Specifications and addenda.

- 3.9.4.2 *Description of Use and Performance Characteristics:* Information should be furnished describing the normal use and expected performance of the product. The Architect and Contractor review this information to confirm that the product is appropriate for the intended use.
- 3.9.4.3 *Size and Physical Characteristics:* The size and physical characteristics, such as adjustment capabilities, which is reviewed by both the Contractor and Architect. The Contractor has the most available information for comparing adjoining materials and equipment. The Contractor also needs to know the size and weight of the equipment for lifting and handling considerations.
- 3.9.4.4 *Finish Characteristics:* The Architect reviews the available finishes and selects the appropriate finish, if the finish was not previously specified in the documents. The Contractor should confirm that finish requirements in the Specifications are being met by the product.
- 3.9.4.5 *Contractor Responsible for Jobsite Dimensions:* Some material is custom-fabricated to job conditions, requiring dimensions from the jobsite. These jobsite dimensions are provided by the Contractor as part of the Contractor's responsibilities for the Project and shall be provided prior to release of the product for manufacture. Contractor shall not rely on Architect or Engineers to provide jobsite dimensions.
- 3.9.4.6 *Full Range of Samples Required (When Specific Items Not Specified).* Except in cases where the exact color and type of item is specified since the District is utilizing items Standardized or pre-selected by District, the full range of color, graining, texture, or other characteristics are anticipated for review in finished products, a sufficient number of samples of the specified materials shall be furnished by the Contractor to indicate the full range of characteristics which will be present in the finished products. Products delivered or erected without Submittal and approval without providing a full range of samples shall be subject to rejection. Except for range samples, and unless otherwise called for in the various sections of the Specifications or Specification Section 1, samples shall be submitted in duplicate.
- 3.9.4.7 *Labeling of Samples.* All samples shall be marked, tagged, or otherwise properly identified with the name of the submitting party, the name of the Project, the purpose for which the samples are submitted and the date.
- 3.9.4.8 *Transmittal letter.* All samples shall be accompanied by a letter of transmittal containing similar information, together with the Specification section number.
- 3.9.4.9 *Labels and Instructions.* All samples of materials shall be supplied with the manufacturer's descriptive labels and application instructions. Each tag

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or sticker shall have clear space for the review stamps of Contractor and Architect.

- 3.9.4.10 *Architect's Review.* The Architect will review and, if appropriate, approve submissions and will return them to the Contractor with the Architect's stamp and signature applied thereto, indicating the timing for review and appropriate action in compliance with the Architect's (or District's) standard procedures. In the cases where a CM is hired by the District, CM may be the party that receives and performance logging and initial processing of the Samples. CM may, in some cases, reject samples that are not in conformance with Contract requirements.

3.9.5 Submittal Submission Procedure

- 3.9.5.1 *Transmittal Letter and Other Requirements.* All Submittals must be properly identified with the name of the Project and dated, and each lot submitted must be accompanied by a letter of transmittal referring to the name of the Project and to the Specification section number for identification of each item clearly stating in narrative form, as well as "clouding" on the submissions, all qualifications, departures, or deviations from the Contract Documents. Shop Drawings, for each section of the Work shall be numbered consecutively and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each drawing shall have a clear space for the stamps of Architect and Contractor. Refer to Division 1. In the case where a CM is hired on the Project, the CM may be designated to receive the Submittals for the Project, log the Submittals, and in some cases reject Submittals that do not conform to Contract requirements. Submittal Procedures for further information.
- 3.9.5.2 *Copies Required.* Each Submittal shall include one (1) legible, reproducible (if electronic is available, electronic copies shall also be provided) and five (5) legible prints of each drawing or schedule, table, cut sheet, etc., including fabrication, erection, layout and setting drawings, and such other drawings as required under the various sections of the Specifications, until final acceptance thereof is obtained. Subcontractor shall submit copies, in an amount as requested by the Contractor, of: (1) manufacturers' descriptive data for materials, equipment, and fixtures, including catalog sheets showing dimensions, performance, characteristics, and capacities; (2) wiring diagrams and controls; (3) schedules; (4) all seismic calculations and other calculations; and (5) other pertinent information as required by the District or Architect. (See also Division 1)
- 3.9.5.3 *Corrections.* The Contractor shall make all corrections required by Architect, District or CM and shall resubmit, as required by Architect or CM, corrected copies of Shop Drawings or new samples until approved. Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than one

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(1) re-review of required Submittals of Shop Drawings, Product Data, or samples are subject to charge to the Contractor pursuant to Article 4.5.

3.9.5.4 *Approval Prior to Commencement of Work.* No portion of the Work requiring a Shop Drawing or sample submission or other Submittal shall be commenced until the submission has been reviewed by Contractor and Architect (and CM, if applicable) and approved by Architect (and CM where applicable) unless specifically directed in writing by the Architect. All such portions of the Work shall be in accordance with approved Shop Drawings and samples.

3.9.5.5 *District's Property.* All Submittals, Shop Drawings, computer disks, BIM modeling information, clash checks, schedules, annotated Specifications, samples and other Submittals shall become the District's property upon receipt by the District or Architect.

3.9.6 Schedule Requirements for Submittals

Contractor shall obtain and shall submit all required Submittals (i.e. Shop Drawings, Deferred Approvals, Samples, etc.), in accordance with Contractor's "Schedule for Submission of Shop Drawings and Samples" as required in the scheduling portion of the General Conditions at Articles 8 and the Specifications (as long as the Specifications do not conflict with General Conditions. In the case of conflict, the conflicting provision shall be controlled by the General Conditions and the remaining Specifications sections shall be interpreted as if the general conditions language is inserted) with such promptness as to cause no delay in its own Work or in that of any other contractor or subcontractor but in no event later than thirty five (35) days after the Notice to Proceed is issued except in the specific cases noted as an exception under Article 3.7.2.1. No extensions of time will be granted to Contractor or any Subcontractor because of its failure to have Shop Drawings and samples submitted in accordance with Division 1 and the Schedule. Each Subcontractor shall submit all Shop Drawings, samples, and manufacturer's descriptive data for the review of the District, the Contractor, and the Architect through the Contractor.

3.9.6.1 *Consideration of Schedule.* Contractor has considered lead times, DSA or other agency governmental review times, Architect or Engineer review times, manufacturing seasons, and specific long lead procurement concerns for all submittals for the Project.

3.9.7 General Submittal Requirements

3.9.7.1 *Contractor Submittal Representations and Coordination.* By submitting Shop Drawings, Product Data, samples, etc., the Contractor represents that it has determined and verified all materials, field measurements, catalog numbers, related field construction criteria, and other relevant data in connection with each such submission, and that it has checked, verified, and coordinated the information contained within such Submittals with the requirements of the Work and of the Contract Documents, including the construction schedule.

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- 3.9.7.2 *Contractor Coordination.* Contractor shall stamp, sign, and date each Submittal indicating its representation that the Submittal meets all of the requirements of the Contract Documents and evidence Contractor's review through execution of the following stamp to be placed on each Shop Drawings:

"[Contractor] has reviewed and approved the field dimensions and the construction criteria, and has also made written notation regarding any information in the Shop Drawings and Submittals that does not conform to the Contract Documents. This Shop Drawing or Submittal has been coordinated with all other Shop Drawings and Submittals received to date by me as Contractor and this duty of coordination has not been delegated to Subcontractors, material suppliers, the Architect, or the Engineers on this Project.

Signature of Contractor and date

- 3.9.7.3 *No Deviation from Contract Documents.* The submission of the Shop Drawings, Product Data, samples, etc., shall not deviate from the *requirements* of the Contract Documents including detailing and design intent which is specifically outlined in Contract Documents except as specifically authorized by the Architect or through an accepted substitution pursuant to Article 3.10.4. All deviations from the Contract Documents shall be narratively described in a transmittal accompanying the Shop Drawings. However, Shop Drawings shall not be used as a means of requesting a substitution, the procedure for which is defined in Article 3.10.4, "Substitutions."
- 3.9.7.4 *Contractor Responsibility for Shop Drawings Conformance to Contract Documents.* Review by District and Architect shall not relieve the Contractor or any Subcontractor from its responsibility in preparing and submitting proper Shop Drawings in accordance with the Contract Documents.
- 3.9.7.5 *Incomplete Submittals.* Any submission, which in Architect's opinion is incomplete, contains errors, or has been checked superficially, will be returned not reviewed by the Architect for resubmission by the Contractor. Refer to Submittal Procedures of the Specifications for additional information. The Contractor shall be responsible for any related delays and shall not be the basis for any Claim.
- 3.9.7.6 *Shop Drawings and Submittals Shall Not Be Used as a Method to Make a Substitution.* Shop Drawings and Submittals shall not be used as a means of requesting a substitution or to make changes in the Contract Documents. If changes are made to the Contract Documents through the Shop Drawings, the Architect shall have the right to reject the Submittal. If the Architect does not note the deviation from the approved Plans and Specifications, the Contractor is still responsible for the change and the Architect or the District may require the Shop Drawings be revised to properly reflect the approved Contract Documents. The Architect or District may also require that the Contractor bear all costs under Article 4.5 and consequential damages associated with a CCD to revise Plans and Specifications to accommodate the deviation from approved Plans and Specifications.

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3.9.7.7 Extent of Review. In reviewing Shop Drawings, the Architect will not verify dimensions and field conditions. The Architect will review and approve Shop Drawings, Product Data, samples, etc., for aesthetics and for conformance with the design concept of the Work and the information in the Contract Documents. The Architect's review shall neither be construed as a complete check which relieves the Contractor, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist or from any departures or deviations from the requirements of the Contract Documents unless the Contractor has, in writing, called the Architect's attention to the deviations at the time of submission. The Architect's review shall not relieve the Contractor or Subcontractors from responsibility for errors of any sort in Shop Drawings or schedules, for proper fitting of the Work, coordination of the differing Subcontractor trades and Shop Drawings and Work which is not indicated on the Shop Drawings at the time of submission of Shop Drawings. Contractor and Subcontractors shall be solely responsible for any quantities which may be shown on the Submittals or Contract Documents.

3.10 SUBSTITUTIONS

3.10.1 Definition

A Substitution is a change in product, material, equipment, or method of construction from those required by the Construction Documents proposed by the Contractor. For this Project, a Substitution is subject to the filing of a Construction Substitution Request Form at the time of bid and meeting the requirements of this Article.

3.10.2 One Product Specified

Unless the Specifications state that no substitution is permitted, whenever the Contract Documents indicate any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction or any specific name, make, trade name, or catalog number, with or without the words "or equal," such specification shall be deemed to be used for the purpose of facilitating description of the material, process, or article desired and shall be deemed to be followed by the words "or equal." Subject to the requirements of properly submitting a Substitution Request for as Addressed in Article 3.10.4, the Contractor may, unless otherwise stated, offer any material, process, article, etc., which shall be materially equal or better in every respect to that so indicated or specified ("Specified Item") and will completely accomplish the purpose of the Contract Documents.

3.10.3 Products Specified Which Are Commercially Unavailable

If the Contractor fails to make a request for substitutions for products, prior to the submission of its bid, and such products subsequently become commercially unavailable, the Contractor may request a substitution for such commercially unavailable item. The decision to grant this request is solely at the District's discretion. The written approval of the District, consistent with the procedure for Change Orders, shall be required for the use of a proposed substitute material. The District may condition its approval of the substitution upon the delivery to District of an extended warranty or other assurances of adequate performance of the substitution as well as an equitable deduction in the Contract

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Price should the substituted item cost less than the Specified Item. All risks of delay due the approval of a requested substitution by the DSA, or any other governmental agency having jurisdiction, shall be on the requesting party. All additional costs, DSA review costs, all procurement and construction delays, and all costs for review by the Architect or its consultants shall be the responsibility of the Contractor and will be deducted from Contractor's pay request.

3.10.4 Substitution Request Form

Requests for substitutions of products, materials, or processes in place of a Specified Item must be in writing on the District's Substitution Request Form ("Request Form") at the time of submitting bids to the District, except as provided for in Article 3.10.3.

The Request Form must be accompanied by evidence as to whether the proposed substitution:

- a. Is equal in quality/service/ability to the Specified Item;
- b. Will entail no changes in detail, construction, and scheduling of related work;
- c. Will be acceptable in consideration of the required design and artistic effect;
- d. Will provide no cost disadvantage to the District;
- e. Will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts; and
- f. Will required no change of the construction schedule.

In completing the Request Form, the bidder must state, with respect to each requested substitution, whether the bidder will agree to provide the Specified Item in the event that the District denies the bidder's request for such requested substitution. In the event that the bidder has agreed in the Request Form to provide the Specified Item and the District denies the bidder's requested substitution for a Specified Item, the bidder shall provide the Specified Item without any additional cost or charge to the District.

After bids are opened, the apparent lowest bidder shall provide, within five (5) days of opening such bids, any and all Drawing, Specifications, samples, performance data, calculations, and other information, as may be required to assist the Architect, CM and the District in determining whether the proposed substitution is acceptable. The burden of establishing these facts shall be upon the bidder.

After the District's receipt of such evidence by the bidder, the District will make its final decision as to whether the bidder's request for substitution for any Specified Items will be granted. The decision as to whether a proposed request for substitution is equal to a Specified Item shall be at the sole discretion of the District. Any request for substitution that is granted by the District shall be documented and processed though a Change Order. Contractor must submit a complete Submittal of the requested substitution and a Shop Drawing showing configuration, dimensions, and other critical information associated with the substitution that meets the requirements of Article 3.9. The District may condition its approval of any substitution upon delivery to the District of an extended warranty or other assurances of adequate performance of the substitution. Any and all risks of delay due to approval by the DSA or any other governmental agency having jurisdiction shall be on the bidder.

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If the Architect and District accept a proposed substitution, the Contractor agrees to pay for all DSA review costs, engineering and design services, including, without limitation, compensation to the Architect and affected engineers for their required time to process such substitution through the Division of the State Architect, if required, and to make all changes and adjustments in materials or the work of all trades directly or indirectly affected by the substituted item or items at no cost to the District.

3.10.5 Substitution Requests After Bid

The District, in its sole discretion, may accept a request for substitution by the Contractor or may request Contractor substitute a specified item. Any substitutions requested after bids are opened shall be subject to the same conditions and requirements set forth in Article 3.10.4 above. If any substitutions, that in the District or Architect's determination, results in a credit to the District, the credit amount shall be agreed upon in writing, otherwise, the request for substitution shall be deemed denied.

3.11 INTEGRATION OF WORK

3.11.1 Scope

The Contractor shall be responsible for cutting, fitting, or patching to complete the Work and to make all parts fit together properly. Contractor shall be responsible for ensuring that all trades are coordinated and scheduled so as to ensure the timely and proper execution of the work. When modifying existing work or installing new Work adjacent to existing work, Contractor shall match, as closely as conditions of Site and materials will allow, the finishes, textures, and colors of the original work, refinishing existing work at no additional cost to District. All cost caused by defective or ill-timed work shall be borne by Contractor. Contractor shall be solely responsible for protecting existing work on adjacent properties and shall obtain all required permits for shoring and excavations near property lines.

3.11.2 Structural Members

New or existing structural members and elements, including reinforcing bars and seismic bracing, shall not be cut, bored, or drilled except by written authority of the Architect. Work done contrary to such authority is at the Contractor's risk and subject to replacement at its own expense without reimbursement under the Contract. Schedule delays resulting from Agency approvals for unauthorized work shall be the Contractor's responsibility.

3.11.3 Subsequent Removal

Permission to patch any areas or items of the Work shall not constitute a waiver of the District's or the Architect's right to require complete removal and replacement of the areas of items of the Work if, in the opinion of the Architect or the District, the patching does not satisfactorily restore quality and appearance of the Work or does not otherwise conform to the Contract Documents.

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3.12 CLEANING UP

3.12.1 Contractor's Responsibility to Clean Up

Contractor at all times shall keep premises free from debris such as waste, dust, excess water, storm water runoffs, rubbish, and excess materials and equipment. Contractor shall not leave debris under, in, or about the premises, but shall promptly remove same from the premises and dispose of it in a lawful manner. Disposal receipts or dump tickets shall be furnished to the Architect within five (5) days of request.

Contractor shall remove rubbish and debris resulting from the Work on a daily basis. Contractor shall maintain the structures and Site in a clean and orderly condition at all times until acceptance of the Project by the District. Contractor shall keep its access driveways and adjacent streets, sidewalks, gutters and drains free of rubbish, debris and excess water by cleaning and removal each day. All concrete, sidewalks, and paths of travel shall be broom cleaned daily.

3.12.2 General Final Clean-Up

Upon completion of Work, Contractor shall employ experience workers or professional cleaners for final cleaning. Contractor shall clean each surface to the condition expected in a normal, commercial, building cleaning and maintenance program including, but not limited to, the performed of the following:

- a. Clean interior and exterior of buildings, including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal projections, and any areas where debris has collected, so surfaces are free from foreign material or discoloration;
- b. Clean the Project site. The grounds should be cleared of any Contractor equipment, raked clean of debris and trash removed. Sweep paved areas broom clean;
- c. Repair or replace any damaged materials. Replace any chipped or broken glass;
- d. Remove any and all stains;
- e. Remove labels that aren't permanent labels;
- f. Clean and polish all glass, plumbing fixtures, equipment, finish hardware and similar finish surfaces. Remove any glazing compounds;
- g. Remove temporary utilities, fencing, barricades, planking, sanitary facilities and similar temporary facilities from Site;
- h. Remove temporary film that remains on any hardware, doors or other surfaces; and
- i. Seal the bottom and tops of all doors.
- j.

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3.12.3 Special Clean-Up.

In addition to the general cleaning, the following special cleaning shall be done at the completion of the Work in accordance with the Specifications including, but not limited to:

- a. Remove putty stains from glazing, then wash and polish glazing;
- b. Remove marks, stains, fingerprints and other soil or dirt from painted, stained or decorated work;
- c. Remove temporary protection and clean and polish floors and waxed surfaces;
- d. Clean and polish hardware and plumbing trim; remove stains, dust, dirt, plaster and paint;
- e. Wipe surfaces of mechanical and electrical equipment;
- f. Remove spots, soil, plaster and paint from tile work, and wash tile;
- g. Clean all fixtures and equipment, remove excess lubrication, clean light fixtures and lamps, polish metal surfaces;
- h. Vacuum-clean carpeted surfaces; and
- i. Remove debris from roofs, down spout and drainage system.

3.12.4 Failure to Cleanup

If the Contractor fails to clean up as provided in the Contract Documents, the District may do so, and the cost thereof shall be the responsibility of the Contractor pursuant to Article 2.2 and seek a Deductive Change Order.

3.13 ACCESS TO WORK

The Contractor shall provide the District, the Architect, Engineers and the Inspector of Record, access to the Work in preparation and progress wherever located. Contractor shall provide safe and proper facilities for such access so that District's representatives may perform their functions.

CONTRACTOR IS AWARE THAT THIS CONTRACT MAY BE SPLIT INTO SEVERAL PHASES AS ADDRESSED IN ARTICLE 6.

3.13.1 Special Inspection, Inspections or Tests Out of State, Out of Country or Remote from Project

If Contractor has a Subcontractor or supplier that requires in plant or special inspections or inspections or tests that are out of the country, out of the state, or a distance of more than 200 miles from the Project site, the Special Inspector or Inspector shall be provided access so the special inspection or inspection may occur in the remote location. In some cases, the DSA Inspector may also require access in addition to Special Inspectors and

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individuals performing tests. Inspections/tests shall occur during normal work hours.
(See also Article 4.3.6)

3.14 ROYALTIES AND PATENTS

3.14.1 Payment and Indemnity for Infringement

Contractor shall hold and save the District and its officers, agents, and employees, the Construction Manager, the Architect, and the Architect's consultants harmless from liability of any nature or kind, including cost and expense, for or on account of any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the District, unless otherwise specifically provided in the Contract Documents, and unless such liability arises from the sole negligence, or active negligence, or willful misconduct of the District, the Architect, or the Architect's consultants.

3.14.2 Review

The review by the Architect of any method of construction, invention, appliance, process, article, device, or material of any kind shall be for its adequacy for the Work and shall not be an approval for the use by the Contractor in violation of any patent or other rights of any person or entity.

3.15 INDEMNIFICATION

3.15.1 Contractor

See Agreement Form. Contractor shall ensure that its contract with each of its Subcontractors contains provisions requiring the Subcontractors to defend, indemnify and hold harmless the District, Architect, Inspector, the State of California to a minimum level as set forth in this Article and consistent with the indemnity and hold harmless language in the Agreement Form.

The Contractor's and Subcontractors' obligation to defend, indemnify and hold harmless the District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors hereunder shall include, without limitation, any and all claims, damages, and costs for the following: (1) any damages or injury to or death of any person, and damage or injury to, loss (including theft), or loss of use of, any property; (2) breach of any warranty, express or implied; (3) failure of the Contractor or Subcontractors to comply with any applicable governmental law, rule, regulation, or other requirement; (4) products installed in or used in connection with the Work; and (5) any claims of violation of the Americans with Disabilities Act ("ADA")

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3.16 SUBMISSION OF DAILY REPORTS

3.16.1 General

By 10:00 a.m. on the following business day, the Contractor shall submit a Daily Report to the Inspector and copy the Architect for the previous day's Work. If there is a Construction Manager, the original Daily Report is to be provided to the Construction Manager and copies sent to the Architect and the Inspector. Daily Reports shall be prepared on forms approved by the District, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day. The District reserves the right to note inconsistencies or inaccuracies in the Daily Reports. In such cases, pertinent notes shall be entered by each party to explain points which cannot be resolved that day. Each party shall retain a signed copy of the report. Daily Reports by Subcontractors or others shall be submitted through the Contractor.

3.16.2 Labor

The Daily Report shall show names of workers, classifications, hours worked and hourly rate. The locations where work occurred shall also be identified in the Daily Report. Project superintendent expenses are not allowed.

3.16.3 Materials

The Daily Report required shall describe and list quantities of materials used and unit costs.

3.16.4 Equipment

The Daily Report required shall show type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable, and hourly/daily cost. Move-on and move-off fees shall be noted.

3.16.5 Other Services and Expenditures

Other services and expenditures shall be described in the Daily Report in detail as the District requires.

3.16.6 Failure to Submit Daily Report

If Contractor does not submit its Daily Report by 10 am the next business day, the Inspector of Record shall prepare a Daily Report addressing each of the above items. The cost for the Inspector's services to prepare the Daily Report shall be addressed through a Deductive Change Order under Article 7.7.4.

3.17 AS-BUILT DRAWINGS AND ANNOTATED SPECIFICATIONS

Throughout the duration of the Project, Contractor shall maintain on a current basis an accurate and complete set of As-Built Drawings (and Annotated Specifications) clearly showing all changes, revisions to Specifications and substitutions during construction, including, without limitation, field changes and the final location of all electrical and mechanical equipment, utility lines, ducts, outlets, structural members, walls, partitions, and other significant features. In case a Specification allows Contractor to elect one of

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several brands, makes, or types of material or equipment, the annotations shall show which of the allowable items the Contractor has furnished. The Contractor will update the As-Built Drawings and Annotated Specifications as often as necessary to keep them current, but no less often than weekly.

Contractor shall update As-Built Drawings with complete information on an area of Work at or near the time when the Work is being performed and prior to any DSA 152 sign off and prior to any Work being covered.

The As-Built Drawings and Annotated Specifications shall be kept at the Site and available for review and inspection by the District and the Architect. Failure to maintain and update the As-Built Drawings is a basis to withhold Progress Payments pursuant to Article 9.6.

3.17.1 Upon Beneficial Occupancy

Contractor shall obtain and pay for reproducible Plans upon Beneficial Occupancy. Contractor shall deliver Plans to District Representative (Construction Manager if one is hired for the Project).

3.17.2 As-Built at Completion of Work

Upon completion of the Work and prior to and as a condition precedent to Application for Retention Payment, the Contractor will provide one neatly prepared and complete set of As-Built Drawings and Annotated Specifications to the District. Contractor shall certify the As-Built as a complete and accurate reflection of the actual construction conditions of the Work by affixing a stamp indicating the Drawings are As-Built and certifying accuracy on the final set of As-Built. Failure to deliver a complete As-Built set of Drawings may result in significant withholdings to ensure Work is properly documented. (See Article 9.9.2)

3.17.3 Log of Control and Survey Documentation

Contractor shall complete and maintain an accurate log or all control and survey documentation for the Project as the Work progresses. All reference and control points shall be recorded on the As-Built Drawings. The basis of elevations shall be one of the established benchmarks that must be maintained on the As-Built.

3.17.4 Record Coordinates for Key Items

Contractor shall record, by coordinates, all utilities on-site with top of pipe elevations, major grade and alignment changes, rim, grate or top of curb and flow line elevations of all drainage structures and sewer manholes. Contractor shall update record information at or near the time when work is occurring in an area and prior to DSA 152 sign off on any category of Work and prior to covering the Work.

3.17.5 BIM As-Built Drawings

If BIM is utilized for the Project, then an electronic version of such As-Built Drawings and Annotated Specifications will be delivered to District (in an acceptable format to District).

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3.18 EQUIPMENT MANUALS

Contractor shall obtain and furnish three (3) complete sets of manuals containing the manufacturers' instructions for maintenance and operation of each item of equipment and apparatus furnished under the Contract Documents and any additional data specifically requested under the various sections of the Specifications for each division of the Work. The manuals shall be arranged in logical, sequential order, labeled, indexed, and placed in three-ring binders. At the completion of its Work, the Contractor shall certify, by endorsement thereon, that each of the manuals is complete, accurate, and covers all of its Work. Prior to submittal of Contractor's Application for Retention Payment, and as a further condition to its approval by the Architect, each Subcontractor shall deliver the manuals, arranged in logical, sequential order, labeled, indexed, endorsed, and placed in three-ring binders, to the Contractor, who shall assemble these manuals for all divisions of the Work, review them for completeness, and submit them to the District through the Architect.

3.19 DIR REGISTRATION

Strict compliance with all DIR registration requirements in accordance with Labor Code sections 1725.5 and 1771.1 is a material obligation of the Contractor and all of its subcontractors (of any tier) under the Contract Documents. The foregoing includes, without limitation, compliance with DIR registration requirements at all times during performance of the Work by the Contractor and all of its subcontractors of any tier. The failure of the Contractor and all subcontractors of any tier to be properly registered with DIR at all times during performance of the Work is a material breach of the Contract and subject to termination for cause.

An affirmative and ongoing obligation of the Contractor under the Contract Documents is the verification that all subcontractors of any tier are at all times during performance of the Work are in full and strict compliance with the DIR registration requirements. The Contractor shall not permit or allow any subcontractor of any tier to perform any Work without the Contractor's verification that all subcontractors are in full and strict compliance with the DIR registration requirements. Any subcontractors of any tier not properly registered with DIR shall be substituted in accordance with Labor Code section 1771.1. Contractor or its subcontractors of any tier shall not be entitled to any additional costs or time arising from or in any way related to compliance with the DIR registration requirements.

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ARTICLE 4 ADMINISTRATION OF THE CONTRACT AND CLAIMS

4.1 ARCHITECT

4.1.1 Replacement of Architect

In the case of the termination of the Architect, the District may appoint an Architect or another construction professional or may perform such functions with its own licensed professional personnel. The status of the replacement Architect under the Contract Documents shall be the same as that of the former Architect.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 Status

Pursuant to Titles 2 of the California Code of Regulations and as required pursuant to the Field Act, Education Code 17280 et seq., the Architect will provide administration of the Contract Documents and the Work, and will be the District's representative during construction, as well as during the one (1) year period following the commencement of any warranties. The Architect will have authority to act on behalf of the District only to the extent provided in the Contract Documents.

4.2.2 Site Visits

The Architect will visit the Site at intervals necessary in the judgment of the Architect to become generally familiar with the progress and quality of the Work and to determine in general if the Work is being performed in accordance with the Contract Documents and as otherwise required by DSA.

4.2.3 Limitations of Construction Responsibility

The Architect, District and CM shall not have control over, charge of, or be responsible for construction means, methods, techniques, schedules, sequences or procedures, fabrication, procurement, shipment, delivery, receipt, installation, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility under the Contract Documents. The Architect, District and CM shall not be responsible for the Contractor's, Subcontractors', material or equipment suppliers', or any other person's schedules or failure to carry out the Work in accordance with the Contract Documents. The Architect, District and CM shall not have control over or charge of acts or omissions of the Contractor, Subcontractors, their agents or employees, or any other persons or entities performing or supplying portions of the Work. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect, District or CM in the Architect, District or CM's administration of the Contract Documents, or by tests, inspections, or approvals required or performed by persons other than the Contractor.

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4.2.4 Communications Facilitating Contract Administration

Except where a CM is on the Project, or as otherwise provided in the Contract Documents or when direct communications are warranted by special circumstances, the District and the Contractor shall communicate through the Architect. In the cases where a CM is hired for the Project, all communication shall be through the CM (unless otherwise directed) with copies to the District, Architect and Inspector. Where direct communication is necessary between the District and the Contractor, the District's communication shall be through the District's authorized designated person. The Architect and CM shall be promptly informed, and shall receive copies of all written communications. Contractor shall not rely upon any communications from the District that is not from the District's Representative. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material or equipment suppliers shall be through the Contractor. In the case where a CM is hired for the Project, the CM shall be the main point of contact for communication of information. Copies should be sent to the Architect, District Representative and Inspector.

4.2.5 Payment Applications

The Architect will review and make recommendations to the District regarding the amounts due the Contractor on the Certificates for Payment pursuant to Article 9.3.4 and subject to the Inspector's review, (CM review, if applicable) and Architect's observation. This review of Payment Applications is sometimes called a "Pencil Draft." Return of a Pencil Draft shall constitute the District's dispute of the Payment Application that has been submitted. Contractor shall promptly respond to Pencil Drafts or Contractor's Payment Applications may be delayed. Contractor's failure to promptly respond to a Pencil Draft shall qualify as a delay in the Prompt Payment of a Request for Payment or Request for Retention.

4.2.6 Rejection of Work

In addition to the rights, duties, and obligations of the Inspector under this Article, the Architect may recommend to the District that the District reject Work which does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable to achieve the intent of the Contract Documents, the Architect (and/or CM) may recommend to the District that the District require additional inspection or testing of the Work in accordance with Article 13.5, whether or not such Work is Fabricated, installed, or completed. District may have Non-conforming Work removed and replaced pursuant to Article 9.7. However, neither this authority of the Architect (or CM) nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect (or CM) to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

Contractor shall, without charge, replace or correct Work found by the District to not be in conformance to Contract requirements. Contractor shall promptly segregate and remove rejected materials from the Project site.

This section does not address a Notice of Non-Compliance and the remedies associated with a Notice of Non-Compliance which are addressed at Article 7.1.2

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4.2.7 Warranties upon Completion

The Architect (and where applicable CM), in conjunction with the Inspector will conduct field reviews of the Work to determine the date of Substantial Completion and of Final Completion, shall receive and forward to the District for the District's review written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment when the Architect believes the Work has been completed in compliance with the requirements of the Contract Documents (See Article 9.11 for Close-Out). The handling by the Architect (or where applicable CM) of such warranties, maintenance manuals, or similar documents shall not diminish or transfer to the Architect any responsibilities or liabilities required by the Contract Documents of the Contractor or other entities, parties, or persons performing or supplying the Work.

On some Projects, the District will take a phased occupancy of the Project. In those cases, the District may commence the running of warranties on the buildings, or phases that are accepted after Punch List is completed and the District has accepted Completion of the separate phase. A separate Notice of Completion may be filed for the separate building or phase of work and warranties shall commence for the separate phase only to the extent that warranties do not require coordination or connection to other buildings or other parts of the site and only if the warranted item is completed to its entirety in the segregated building or phased area.

If written warranties are not provided at the time the Punch List is nearing completion, Architect (with recommendations from the CM and Inspector) shall determine the dollar value of the warranties and shall make recommendation for withholdings necessary to effectuate the transfer of such warranties to the District for future use as part of the Punch List for the Project pursuant to Article 9.6.

Warranties are not commenced through utilizing of equipment for testing and operation as necessary to acclimate buildings or where necessary to test systems.

4.2.8 Interpretation

The Architect will interpret and decide matters concerning performance and requirements of the Contract Documents. Architect shall make clarifications as necessary to interpret the Contract Documents.

4.3 PROJECT INSPECTOR

4.3.1 General

One or more Project Inspectors employed by the District and approved by the Division of the State Architect will be assigned to the Work in accordance with the requirements of Title 24 of the California Code of Regulations. The Inspector(s) duties are as specifically defined in Title 24 Section 4-333 and 4-342 and in DSA IR A-8.

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4.3.2 Inspector's Duties and DSA Noted Timelines for Inspection

All Work shall be under the observation of the Inspector. Contractor shall establish a protocol for requesting inspection with Inspector so as to not delay the Work and provide adequate time for the Inspector to perform inspection. If such a protocol is not established ahead of time, Inspector may utilize the time criteria set by Title 24 of 48 hours in advance of submitting form DSA 156 for each new area. The Inspector shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the Inspector such information as may be necessary to keep the Inspector fully informed regarding progress and manner of Work and character of materials. Such observations shall not, in any way, relieve the Contractor from responsibility for full compliance with all terms and conditions of the Contract, or be construed to lessen to any degree the Contractor's responsibility for providing efficient and capable superintendence. The Inspector is not authorized to make changes in the Drawings or Specifications nor shall the Inspector's approval of the Work and methods relieve the Contractor of responsibility for the correction of subsequently discovered defects, or from its obligation to comply with the Contract Documents.

Inspector shall electronically post DSA required documents on the DSA electronic posting website. It is the Contractor's responsibility to determine the status of posting and determine if all the criteria for sign off of a category of Work on the Project Inspection Card (Form DSA 152) as defined more thoroughly in the most current version of the DSA 152 manual posted on the DSA website.

Inspector may collaborate with Contractor about approval of areas that may be constructed and approved incrementally under the DSA 152 card pursuant to the guidelines of PR-13 at Article 1.17. Inspector shall work with Contractor to present incremental approval proposals to DSA.

4.3.3 Inspector's Authority to Reject or Stop Work

The Inspector shall have the authority to reject Work whenever provisions of the Contract Documents are not being complied with, and Contractor shall instruct its Subcontractors and employees accordingly. In addition, the Inspector may stop any Work that poses a probable risk of harm to persons or property. The Contractor shall instruct its employees, Subcontractors, material and equipment suppliers, etc., accordingly. The absence of any Stop Work Order or rejection of any portion of the Work shall not relieve the Contractor from any of its obligations pursuant to the Contract Documents.

4.3.4 Inspector's Facilities

Within seven (7) days after the notice to proceed, the Contractor shall provide the Inspector with the temporary facilities as required. More specific requirements for the Inspector facilities may be further described under Division 1 of the Specifications.

4.3.5 Testing Times

The District will provide inspection and testing at its cost during the normal eight (8) hour day Monday through Friday (except holidays). Work by the Contractor outside of the normal eight (8) hour day shall constitute an authorization from the Contractor to the District to provide inspection and testing as required outside of the normal eight (8) hour

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day. Contractor shall provide adequate time for inspections so as to not delay the Work. An advanced timing protocol may be established pursuant to Article 4.3.2. If the Contractor is behind Schedule then it is incumbent on the Contractor to provide advance forecast through look ahead of the anticipated date for inspection so the Inspector may plan their activities so as to not delay the Project. Contractor shall reimburse District for any additional costs associated with inspection and testing (including re-inspection and re-testing) outside the normal eight-hour day and for any retests caused by the Contractor.

It is the Contractor's responsibility to request special inspections with sufficient time so all testing may be timely completed and posted so work may proceed and the Inspector's signature is attached to the Project Inspection Card (Form 152). Specifically, timely request for special inspection under the DSA Verified Report Forms 291 (laboratory), DSA Verified Report Form 292 (Special Inspection), and DSA Verified Report 293 (geotechnical) since DSA requirements under PR 13-01 specifically gives the Special Inspections 14 days to post to the DSA website. Failure to plan and pay (if applicable) for quicker delivery of Special Inspections may be counted as Float, but is not considered Governmental Delay Float under Article 8.1.4.

4.3.6 Special Inspections, Inspections or Tests Out of State, Out of Country or Remote from Project

If Contractor has a Subcontractor or supplier that requires in plant or special inspections, inspections or tests that are out of the country, out of the state or a distance of more than 200 miles from the Project Site, the District shall provide the Special Inspector or individual performing tests time for inspection and testing during normal work hours. Contractor, however, is responsible for the cost of travel, housing, food, out of area premiums that may be in the Inspector/Testing Agreement with District, or other expenses necessary to ensure proper inspection, special inspection or testing is provided by a DSA Certified Inspector, Special Inspector, or individual performing tests. In some cases all three (DSA Inspector, Special Inspector, and Tester) may be required. In addition, if the DSA Certified Inspector, Special Inspector, or individual performing test has contractual travel clauses or special rates for out of town inspection, Contractor is responsible for all costs associated with the contractual travel costs in addition to all other costs. Arrangements for inspection and/or testing shall be made far enough in advance so as to not delay the Work.

4.4 STOP WORK ORDER

DSA may issue a Stop Work Order, or an Order to Comply, when either (1) the Work proceeds without DSA approval; (2) the Work proceeds without a DSA Inspector of Record, or (3) where DSA determines that the Work is not being performed in accordance with applicable rules and regulations, and would compromise the structural integrity of the Project or would endanger lives. If a Stop Work Order is issued, the Work in the affected area shall cease until DSA withdraws the Stop Work Order. Pursuant to Education Code section 17307.5(b), the District shall not be held liable in any action filed against the District for any delays caused by compliance with the Stop Work Order, except to the extent that an error or omission by the District is the basis for the issuance of the Stop Work Order.

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Examples of Stop Work Orders that may be issued by DSA include DSA Bulletin 07-04 and Policy 10-01, the installation of automatic fire sprinkler systems without approved Plans, covering Work that has not been approved by Inspector on DSA Project Inspection Card (Form 152).

4.5 RESPONSIBILITY FOR ADDITIONAL CHARGES INCURRED BY THE DISTRICT FOR PROFESSIONAL SERVICES

If at any time prior to the completion of the requirements under the Contract Documents, the District is required to provide or secure additional professional services (including CM, Inspection, Architect, Engineering and Special Consultant Services) for any reason by any act of the Contractor, the District may seek a Deductive Change Order for any costs incurred for any such additional services, which costs shall be deducted from the next progress payment. A Deductive Change Order shall be independent from any other District remedies and shall not be considered a waiver of any District rights or remedies. If payments then or thereafter due to the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the District. Additional services shall include, but shall not be limited to, the following:

- a. Services made necessary by the default of the Contractor (Article 14 or Article 2.2).
- b. Services made necessary due to the defects or deficiencies in the Work of the Contractor (Article 2.2 and Article 9.6).
- c. Spurious or frivolous RFI's issued that do not conform to the requirements of Article 7.4. Issuance of the same RFI after receiving an answer from the Architect or Engineer
- d. Review of Schedules that are provided by Contractor that do not Conform with the Requirements of Article 8.
- e. Preparation of a CCD or ICD to correct a Contractor Deficiency, or Contractor Caused Notice of Non-Compliance (See Article 7.3).
- f. Review of Incomplete Shop Drawings or Submittals, including the submission of Piecemeal Shop Drawings or Submittals unless piecemeal Submittals are specifically agreed upon by District (See Article 3.9)
- g. Services required by failure of the Contractor to perform according to any provision of the Contract Documents.
- h. Services in connection with evaluating substitutions of products, materials, equipment, Subcontractors' proposed by the Contractor, and making subsequent revisions to Drawings, Specifications, obtaining DSA approvals, DSA costs for review of CCD's, other governmental agency review costs, and providing other documentation required (except for the situation where the specified item is no longer manufactured or available). (See Article 3.10)
- i. Services for evaluating and processing Claims or Disputes submitted by the Contractor in connection with the Work outside the established Change Order process.
- j. Services required by the failure of the Contractor to prosecute the Work in a timely manner in compliance within the specified time of completion.

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- k. Services in conjunction with the testing, adjusting, balancing and start-up of equipment other than the normal amount customarily associated for the type of Work involved.
- l. Services in conjunction with more than one (1) re-review of Submittals of Shop Drawings, Product Data, samples, RFI's etc.

4.6 DISPUTES AND CLAIMS

4.6.1 Decision of Architect

“Disputes” or “Claims” as defined in Article 4.6.9.1 between District and Contractor involving money or time, including those alleging an error or omission by the Architect shall be referred initially to the Architect for action as provided in Article 4.6.2 within ten (10) days after Contractor’s Article 7 request for Change is denied. If there is a CM, the CM shall receive the Dispute and may review and also assemble opinions and documents to assist the Architect. A decision by the Architect, as provided in Article 4.6.5, shall be required as a condition precedent to proceeding with remedies set forth in Article 4.6.9 as to all such matters arising prior to the date Retention Payment Application is due, regardless of whether such matters relate to execution and progress of the Work, or the extent to which the Work has reached Final Completion.

The condition precedent of an Architect decision shall be waived if: (1) the position of Architect is vacant; (2) the Architect has failed to take action required under Article 4.6.5 within the time periods required therein; or (3) the Dispute or Claim relates to a stop notice claim not arising from any extra Change Order or Immediate Change Directive for which approval has not been provided.

4.6.2 Architect’s Review

The Architect (and CM) will review the Dispute and take one or more of the following preliminary actions upon receipt of a Dispute: (1) request additional supporting data from the claimant; (2) submit a schedule to the parties indicating when the Architect expects to take action; (3) reject the Dispute in whole or in part, stating reasons for rejection; (4) recommend approval of the Dispute; or (5) suggest a compromise. The Architect may also, but is not obligated to, notify the Surety, if any, of the nature and amount of the Dispute.

4.6.2.1 *Architectural Immunity.* Architect review of Disputes and Claims shall be impartial and meant to resolve Disputes and Claims. Pursuant to the case, Huber, Hunt & Nichols, Inc. v. Moore (1977) 67 Cal.App.3d 278, the Architect is provided a quasi-judicial immunity for interpreting and deciding Disputes and Claims between the District and Contractor.

4.6.3 Documentation if Resolved

If a Dispute has been resolved, the Architect (and/or CM) will prepare a Change Order or obtain appropriate documentation to document the terms for Board approval.

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4.6.4 Actions if Not Resolved

If a Dispute has not been resolved and all documentation requested pursuant to Article 4.6.2 has been provided, the Contractor shall, within ten (10) days after the Architect's initial response, assemble all the documents involved in the Dispute including copies of all back-up documentation of costs and the basis for the Dispute and take one or more of the following actions: (1) modify the initial Dispute; (2) notify the Architect that the initial Dispute stands; or (3) supplement with additional supporting data and re-submit to the Architect under Article 4.6.2.

4.6.5 Architect's Written Decision

If a Dispute has not been resolved after consideration of the foregoing and of other evidence presented by the parties or requested by the Architect, the Architect (or Architect through CM) shall provide a written decision twenty (20) days after compliance with Article 4.6.4. Upon expiration of such time period, the Architect (or Architect through CM) will render to the parties its written decision relative to the Dispute, including any change in the Contract Sum or Contract Time or both. The Architect may also request reasonable additional time to complete Architect's written decision.

If the resolution of the Dispute by the Architect is not satisfactory to the Contractor and copies of all back-up documentation of costs and the basis for the Dispute is fully articulated in a package of material that is complete, the Contractor may then submit a Claim to the District under Article 4.6.9.

4.6.6 Continuing Contract Performance

Pending final resolution of a Dispute or Claim, including, negotiation, mediation, arbitration, or litigation, the Contractor shall proceed diligently with performance of the Contract, and the District shall continue to make any undisputed payments in accordance with the Contract (less any withholdings or offsets). If the Claim is not resolved, Contractor agrees it will neither rescind the Contract nor stop the progress of the work, but Contractor's sole remedy shall be to submit such controversy to determination by a court of competent jurisdiction in the county where the Project is located, after the Project has been completed, and not before.

4.6.6.1 *District's Option to Submit Individual Disputes to Arbitration during Claims and Disputes Process.* At the District's sole option, in order to more efficiently resolve Claims during the Project and prior to the completion of the Claims Process, pursuant to Government Code section 9201, the District may submit individual Disputes or Claims for binding arbitration and Contractor agrees to the resolution of for each individual Dispute or Claim by an Arbitrator, including resolution of time and delays. If binding arbitration is utilized for individual Disputes or Claims, such resolution is full and final as to that particular Dispute or Claim. THIS INDIVIDUAL DISPUTE ARBITRATION PROCESS IS NOT AN ARBITRATION CLAUSE AND SHALL NOT BE CONSTRUED AS AN AGREEMENT TO ARBITRATE. THIS INDIVIDUAL DISPUTES ARBITRATION PROCESS IS FOR THE SOLE PURPOSE OF STREAMLINING AND RESOLVING DISPUTES OR CLAIMS DURING CONSTRUCTION AND SHALL BE REQUESTED ON SPECIFIC

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INDIVIDUAL ITEMS BY THE DISTRICT PRIOR TO RETENTION PAYMENT (EVEN IF THERE ARE DEDUCTIONS MADE FROM RETENTION PAYMENT) WHICH REPRESENTS THE FINAL COMPLETION OF THE PROJECT.

- a. If there is no Retention remaining on the Project, individual Disputes initiated prior to Project Final Completion shall continue until a final disposition of the Arbitration or resolution of the individual Claim or Dispute.
- b. No Tolling. The Arbitration process shall not toll the Disputes or Claims process under Article 4.6 or the requirement to submit Claims to Court under Article 4.6.9.5.

4.6.7 Claims for Concealed Trenches or Excavations Greater Than Four Feet Below the Surface

When any excavation or trenching extends greater than four feet below the surface or if any condition involving hazardous substances are encountered:

- a. Immediately upon discovery, The Contractor shall promptly, and before the following conditions are disturbed, notify the District, by telephone and in writing, of the condition except:
 1. If such condition is a hazardous waste condition, Contractor's bid includes removal or disposal of hazardous substances. Material that the Contractor believes may be a material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, is required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law. In such case, the notice bulletin procedures of Article 7 apply.
 2. Subsurface or latent physical conditions at the Site differing from those indicated in the Drawings, Specifications, Soils Report, and from Contractor's own investigation under Article 2.1.
 3. Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract.
- b. The District shall investigate the conditions, and if District finds that the conditions do materially so differ, do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work shall issue a Change Order or Construction Change Document under the procedures described in the Contract.
- c. In the event that a dispute arises between the public entity or District and the Contractor whether the conditions materially differ, involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any

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scheduled Completion Date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

4.6.8 Dispute Concerning Extension of Time.

If Contractor and District cannot agree upon an extension of time, whether compensable or not, then Contractor must have first completed the procedures set forth in Article 8.4. Upon completion of the procedures set forth under Article 8.4, Contractor must then comply with the requirements in this Article including those set forth under Article 4.6.9.

4.6.9 Claims Procedures

Pursuant to the remedies under Public Contract Code section 9201 and Government Code section 930.2, Contractor, through execution of this Agreement, also agrees to comply with the Claims requirements of Article 4.6 to quickly and efficiently resolve Disputes and Claims. Further, to provide a level of accuracy to the records submitted, the District shall have the right to audit books and records pursuant to Article 13.11 based on the actual costs incurred and to reduce the uncertainty in resolving Disputes and Claims with limited information.

4.6.9.1 *Procedure Applicable to All Claims*

- a. Definition of Claim: A “Claim” is where a Dispute between the parties rises to the level where backup documentation is assembled and provided to the District as a separate demand by the Contractor for: (1) a time extension, including, without limitation, for relief from damages or penalties for delay assessed by the District under the Contract; (2) payment by the District of money or damages arising from Work done by, or on behalf of, the Contractor pursuant to the Contract and payment for which is not otherwise expressly provided for or to which the Contractor is not otherwise entitled to; or (3) an amount of payment disputed by the District. If the Claim is for damages associated with a DSA Stop Work Order, the Contractor shall not be entitled to a request for Compensation, but shall be entitled to utilize Governmental Delay Float (See Article 8.1.4.1.)
- b. Filing Claim Is Not Basis to Discontinue Work: The Contractor shall promptly comply with Work under the Contract or Work requested by the District even though a written Claim has been filed. The Contractor and the District shall make good faith efforts to resolve any and all Claims that may arise during the performance of the Work covered by this Contract.
- c. Claim Notification: The Contractor shall within seven (7) calendar days after the written decision of the Architect, or if the time period for Architect’s decision has passed under Article 4.6.5, submit a notification in writing sent by registered mail or certified mail with return receipt requested, with the District (and the District’s CM) stating clearly the basis for the Claim and including all relevant and required documents. If the notification is not submitted within seven (7) days after the written

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decision of the Architect or the passage of time under Article 4.6.5, the Contractor shall be deemed to have waived all right to assert the Claim, and the Claim shall be denied. Claims submitted after the Retention Payment date shall also be considered null and void by the District. All Claims shall be reviewed pursuant to Articles 4.6.1 through 4.6.5.

The Formal Notification of Claim must be presented as follows:

- (1) The term "Claim" must be at the top of the page in no smaller than 20 point writing.
 - (2) All documentation submitted pursuant to Article 4.6 to the Architect shall be submitted with the "Claim."
 - (3) A stack of documents, copy of all Project documents, or the submission of random documents shall not constitute an adequate reference to supporting documentation.
 - (4) Any additional or supporting documentation that Contractor believes is relevant should be submitted at this time.
- d. Reasonable Documents to Support Claim: The Contractor shall furnish reasonable documentation to support the Claim. The Contractor shall provide all written detailed documentation which supports the Claim, including but not limited to: arguments, justifications, cost, estimates, Schedule analysis and detailed documentation. The format of the required reasonable documentation to support the Claim shall include, without limitation:
1. Cover letter.
 2. Summary of factual basis of Claim and amount of Claim.
 3. Summary of the basis of the Claim, including the specific clause and section under the Contract under which the Claim is made.
 4. Documents relating to the Claim, including:
 - a. Specifications sections in question.
 - b. Relevant portions of the Drawings
 - c. Applicable Clarifications (RFI's)
 - d. Other relevant information, including responses that were received.
 - e. Contractor Analysis of Claim merit.
 - (a) Contractor's analysis of any Subcontractor vendor Claims that are being passed through.
 - (b) Any analysis performed by outside consultants
 - (c) Any legal analysis that Contractor deems relevant
 - f. Break down of all costs associated with the Claim.

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- g. For Claims relating to time extensions, an analysis and supporting documentation evidencing any effect upon the critical path in conformance with the requirements of Article 8.4 chronology of events and related correspondence.
 - h. Applicable Daily Reports and logs.
 - (a) If the Daily Reports or Logs are not available, lost or destroyed, there shall be a presumption that the lost documentation was unfavorable to the Contractor. See California Civil Jury Instruction 204.
 - i. For Claims involving overhead, cost escalation, acceleration, disruption or increased costs, a full version of job costs reports organized by category of work or Schedule of Values with budget information tracked against actual costs. Any and all supporting back-up data, including the original bid (and associated original unaltered metadata).
 - (a) The metadata and bid information shall be provided confidentially and subject to a protective order to prevent dissemination to other contractors or to the public. However, the bid documentation should remain intact and available for review and inspection in case of this type of increased cost Claim.
 - (b) This data on the bid shall be made available to any District attorneys or experts and shall also be utilized as evidence for any legal proceedings.
 - (c) If the bid documentation is not available, lost or destroyed, there shall be a presumption that the lost bid documentation was unfavorable to the Contractor. See California Civil Jury Instruction 204.
- e. Certification: The Contractor (and Subcontractors, if applicable) shall submit with the Claim a certification under penalty of perjury:
- 1. That the Contractor has reviewed the Claim and that such Claim is made in good faith;
 - 2. Supporting data are accurate and complete to the best of the Contractor's knowledge and belief;
 - 3. The amount requested accurately reflects the amount of compensation for which the Contractor believes the District is liable.
 - 4. That the Contractor is familiar with Government Code sections 12650 et seq. and Penal Code section 72 and that false claims can lead to substantial fines and/or imprisonment.

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- f. Signature of Certification: If the Contractor is not an individual, the certification shall be executed by an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.
- g. Upon receipt of a Claim and all supporting documents as required above, the District shall conduct a reasonable review of the Claim and, within a period not to exceed 45 days, shall provide the Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed. Upon receipt of a Claim, the District and Contractor may, by mutual agreement, extend the time period provided in this paragraph.
- h. If the District needs approval from its governing Board to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the Claim, and the governing Board does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a Claim sent by registered mail or certified mail, return receipt requested, the District shall have up to three days following the next duly publicly noticed meeting of the governing Board after the 45-day period, or extension, expires to provide the Contractor a written statement identifying the disputed portion and the undisputed portion.
- i. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its written statement. If the District fails to issue a written statement, paragraph o below shall apply.
- j. If the Contractor disputes the District's written response, or if the District fails to respond to a Claim issued pursuant to this Article 4.6.9 within the time prescribed, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the District shall schedule a meet and confer conference within 30 days for settlement of the Claim.
- k. Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the District shall provide the Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its written statement. Any disputed portion of the Claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the District and the Contractor sharing the associated costs equally. The District and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the Claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each

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party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the Claim remaining in dispute shall be subject to applicable procedures in Article 4.6.9.5.

- l. For purposes of this Article 4.6.9, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.
- m. Unless otherwise agreed to by the District and the Contractor in writing, the mediation conducted pursuant to this Article 4.6.9 shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.
- n. This Claims process does not preclude the District from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this Article 4.6.9 does not resolve the parties' Claim. This Claims process does not preclude the District from submitting individual Disputes or Claims to binding arbitration pursuant to Article 4.6.9.4 below.
- o. Failure by the District to respond to a Claim from the Contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this Article 4.6.9 shall result in the Claim being deemed rejected in its entirety. A Claim that is denied by reason of the District's failure to have responded to a Claim, or its failure to otherwise meet the time requirements of this Article 4.6.9, shall not constitute an adverse finding with regard to the merits of the Claim or the responsibility or qualifications of the Contractor.
- p. If a subcontractor or a lower tier subcontractor lacks legal standing to assert a Claim against a District because privity of contract does not exist, the Contractor may present to the District a Claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the Contractor present a Claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the Claim be presented to the District shall furnish reasonable documentation to support the Claim. Within 45 days of receipt of this written request, the Contractor shall notify the subcontractor in writing as to whether the Contractor presented the Claim to the District and, if the Contractor did not present the Claim, provide the subcontractor with a statement of the reasons for not having done so.

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- q. Upon receipt of a Claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable.
 - r. The Contractor's Claim shall be denied if it fails to follow the requirements of this Article.
- 4.6.9.2 *District (through CM or District's Agent or Attorney) May Request Additional Information.* Within thirty (30) days of receipt of the Claim and the information under this Article, the District may request in writing any additional documentation supporting the Claim or documentation relating to defenses to the Claim which the District may assert. If additional documents are required, the time in which the Claim is evaluated may be extended by a reasonable time so the Claim and additional documents may be reviewed.
- 4.6.9.3 *Claims Procedures in Addition to Government Code Claim.* Nothing in the Claims procedures set forth in this Article 4 of the General Conditions shall act to waive or relieve the Contractor from meeting the requirements set forth in Government Code section 900 et seq.
- 4.6.9.4 *Binding Arbitration of Individual Claim Issues.* To expedite resolution of Claims pursuant to Public Contract Code section 9201, at the District's sole option, the District may submit individual Claims to Arbitration prior to Retention Payment consistent with the requirements of Article 4.6.6.1.
- 4.6.9.5 *Resolution of Claims in Court of Competent Jurisdiction.* If Claims are not resolved under the procedure set forth and pursuant to Article 4.6.9, such Claim or controversy shall be submitted to a court in the County of the location of the Project after the Project has been completed, and not before.
- 4.6.9.6 *Warranties, Guarantees and Obligations.* The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon Contractor by the General Conditions and amendments thereto; and all of the rights and remedies available to District and Architect thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this Article will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

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ARTICLE 5 SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 Subcontractual Relations Bound to Same Contract Terms at General Contractor

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the same obligations and responsibilities, assumed by Contractor pursuant to the Contract Documents. Each subcontract agreement shall preserve and protect the rights of the District and the Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound. Upon written request of the Subcontractor, the Contractor shall identify to the Subcontractor the terms and conditions of the proposed subcontract agreement, which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.1.2 Subcontractor Licenses and DIR Registration

All Subcontractors shall be properly licensed by the California State Licensing Board. All Subcontractors (of any tier) performing any portion of the Work must comply with the Labor Code sections 1725.5 and 1771.1 and must be properly and currently registered with the California Department of Industrial Relations and qualified to perform public works pursuant to Labor Code section 1725.5 throughout the duration of the Project. No portion of the Work is permitted to be performed by a Subcontractor of any tier unless the subcontractor is properly registered with DIR. Any Subcontractors of any tier not properly registered with DIR shall be substituted in accordance with Labor Code section 1771.1.

5.1.3 Substitution of Subcontractor

Substitution of Subcontractors shall be permitted only as authorized under Public Contract Code §§ 4107 et seq. Any substitutions of Subcontractors shall not result in any increase in the Contract Price or result in the granting of any extension of time for the completion of the Project.

5.1.4 Contingent Assignment of Subcontracts and Other Contracts

Each subcontract, purchase order, vendor contract or agreement for any portion of the Work is hereby assigned by the Contractor to the District provided that:

- a. Such assignment is effective only after Termination of this Contract with the Contractor by the District as provided under Article 14 and only for those

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subcontracts and other contracts and agreements that the District accepts by notifying the Subcontractor or Materialman (as may be applicable) in writing; and

- b. Such assignment is subject to the prior rights of the Surety(ies) obligated under the Payment Bond and Performance Bond.
- c. The Contractor shall include adequate provisions for this contingent assignment of subcontracts and other contracts and agreements in each such document.

ARTICLE 6 CONSTRUCTION BY DISTRICT OR BY SEPARATE CONTRACTORS

6.1 DISTRICT'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 Separate Contracts.

- 6.1.1.1 District reserves the right to let other contracts in connection with this Work. Contractor shall afford other contractors reasonable opportunity for (1) introduction and storage of their materials; (2) access to the Work; and (3) execution of their work. Contractor shall properly connect and coordinate its work with that of other Contractors.
- 6.1.1.2 If any part of Contractor's Work depends on proper execution or results of any other contractor, the Contractor shall inspect and within seven (7) days or less, report to Architect, in writing, any defects in such work that render it unsuitable for proper execution of Contractor's Work. Contractor will be held accountable for damages to District for that Work which it failed to inspect or should have inspected. Contractor's failure to inspect and report shall constitute its acceptance of other contractors' Work as fit and proper for reception of its Work, except as to defects which may develop in other contractors' work after execution of Contractor's work.
- 6.1.1.3 To ensure proper execution of its subsequent Work, Contractor shall measure and inspect Work already in place and shall at once report to the Architect in writing any discrepancy between executed Work as built and the Contract Documents.
- 6.1.1.4 Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by District in prosecution of the Project and the potential impact of such Work on the Baseline Schedule or Schedule updates.
- 6.1.1.5 Nothing herein contained shall be interpreted as granting to Contractor the exclusive occupancy at the site of Project. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Project Site. If execution of any contract by the District is likely to cause interference with Contractor's performance of this Contract, once Contractor provides

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District timely written notice and identifies the Schedule Conflict, District shall decide which contractor shall cease work temporarily and which contractor shall continue, or whether Work can be coordinated so that contractors may proceed simultaneously.

- 6.1.1.6 District shall not be responsible for any damages suffered or extra costs incurred by Contractor resulting directly or indirectly from award or performance or attempted performance of any other contract or contracts at the Project necessary for the performance of the Project (examples include Electrical Utility Contractor, separate offsite contractor, a separate grading contractor, furniture installation etc.)

CONTRACTOR IS AWARE THAT THIS CONTRACT MAY BE SPLIT INTO SEVERAL PHASES BASED ON DOCUMENTATION PROVIDED WITH THIS BID OR DISCUSSED AT THE JOB WALK. CONTRACTOR HAS MADE ALLOWANCE FOR ANY DELAYS OR DAMAGES WHICH MAY ARISE FROM COORDINATION WITH CONTRACTORS REQUIRED FOR OTHER PHASES. IF ANY DELAYS SHOULD ARISE FROM ANOTHER CONTRACTOR WORKING ON A DIFFERENT PHASE, CONTRACTOR'S SOLE REMEDY FOR DAMAGES, INCLUDING DELAY DAMAGES, SHALL BE AGAINST THE CONTRACTOR WHO CAUSED SUCH DAMAGE AND NOT THE DISTRICT. CONTRACTOR SHALL PROVIDE ACCESS TO OTHER CONTRACTORS FOR OTHER PHASES AS NECESSARY TO PREVENT DELAYS AND DAMAGES TO OTHER CONTRACTORS WORKING ON OTHER PHASES OF CONSTRUCTION.

6.1.2 District's Right to Carry Out the Work

(See Article 2.2)

6.1.3 Designation as Contractor

When separate contracts are awarded to contractors on the Project Site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate District/Contractor Agreement.

6.1.4 District Notice to the Contractor of Other Contractors

The Contractor shall have overall responsibility to reasonably coordinate and schedule Contractor's activities with the activities of the District's forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the District in reviewing their construction schedules when:

- a. Notice is provided in the Contract Documents of other scope of Work,
- b. In the case where there is known Work to be performed by other Contractors
- c. For outside contractors hired by utilities

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- d. Where the Contract Document provides “Work by Others” or “By Others”
- e. Where specifically noted during the Pre-Bid Conference
- f. Where specifically noted in the Mandatory Job Walk
- g. By CO or ICD,
- h. With respect to the installation of :
 - 1. Furniture,
 - 2. Electronics and networking equipment,
 - 3. Cabling,
 - 4. Low voltage,
 - 5. Off-site work,
 - 6. Grading (when by a separate contractor),
 - 7. Environmental remediation when excluded by the Contract Documents (i.e. asbestos, lead or other hazardous waste removal)
 - 8. Deep cleaning crews,
 - 9. Commissioning and testing,
 - 10. Keying and re-keying,
 - 11. Programming

6.1.4.1 Exception where no Coordination is Required on the Part of the Contractor for Turn Key Operations. If the Contractor has specifically outlined a “Turn Key” or “Complete Delivery” of a final completed operational school in writing as part of the Baseline Schedule..

6.1.4.2 The Contractor shall make any revisions to the Baseline Schedule (or Schedule Update) and Contract Sum deemed necessary after a joint review and mutual agreement. The Baseline Schedule (or Schedule Update) shall then constitute the Schedules to be used by the Contractor, separate contractors, and the District until subsequently revised. Additionally, Contractor shall coordinate with Architect, District, and Inspector to ensure timely and proper progress of Work.

6.2 CONSTRUCTIVE OWNERSHIP OF PROJECT SITE AND MATERIAL

Upon commencement of Work, the Contractor becomes the constructive owner of the entire site, improvements, material and equipment on Project site. Contractor must ensure proper safety and storage of all materials and assumes responsibility as if Contractor was the owner of the Project site. All risk of loss or damage shall be borne by Contractor during the Work until the date of Completion. As constructive owner of the Project site, Contractor must carry adequate insurance in case of calamity and is not entitled to rely on the insurance requirements as set forth in this Agreement as being adequate coverage in case of calamity.

6.3 DISTRICT’S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors, and the District as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Article 3.12, the District may clean up and allocate the cost among those it deems responsible.

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ARTICLE 7 CHANGES IN THE WORK

7.1 CHANGES

7.1.1 No Changes Without Authorization

There shall be no change whatsoever in the Drawings, Specifications, or in the Work without an executed Change Order, Change Order Request, Immediate Change Directive, or order by the Architect for a minor change in the Work as herein provided. District shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the District's Governing Board or designated representative with delegated authority (subject to Board ratification) has authorized the same and the cost thereof approved in writing by Change Order or executed Construction Change Document. No extension of time for performance of the Work shall be allowed hereunder unless claim for such extension is made at the time changes in the Work are ordered, and such time duly adjusted in writing in the Change Order. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications. Notwithstanding anything to the contrary in this Article 7, all Change Orders shall be prepared and issued by the Architect and shall become effective when executed by the District's Governing Board, the Architect, and the Contractor.

Should any Change Order result in an increase in the Contract Price, the cost of such Change Order shall be agreed to, in writing, in advance by Contractor and District and be subject to the monetary limitations set forth in Public Contract Code section 20118.4 (Please check with the District since there are different interpretations of the limitations of Public Contract Code section 20118.4 depending on the County the Project is located). In the event that Contractor proceeds with any change in Work without first notifying District and obtaining the Architect's and District's consent to a Change Order, Contractor waives any Claim of additional compensation for such additional work and Contractor takes the risk that a Notice of Non-Compliance may issue, a critical path Project delay may occur, and the Contractor will also be responsible for the cost of preparation and DSA CCD review fees for a corrective DSA approved Construction Change Document.

CONTRACTOR UNDERSTANDS, ACKNOWLEDGES, AND AGREES THAT THE REASON FOR THIS NOTICE REQUIREMENT IS SO THAT DISTRICT MAY HAVE AN OPPORTUNITY TO ANALYZE THE WORK AND DECIDE WHETHER THE DISTRICT SHALL PROCEED WITH THE CHANGE ORDER OR ALTER THE PROJECT SO THAT SUCH CHANGE IN WORK BECOMES UNNECESSARY AND TO AVOID THE POSSIBLE DELAYS ASSOCIATED WITH THE ISSUANCE OF A NOTICE OF NON-COMPLIANCE.

7.1.2 Notices of Non-Compliance

Contractor deviation or changes from approved Plans and Specifications may result in the issuance of a Notice of Non-Compliance (See DSA Form 154). Contractor is specifically notified that deviations from the Plans and Specifications, whether major or minor, may result in the requirement to obtain a DSA Construction Change Document to correct the

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Notice of Non-Compliance. (See Article 7.3.1 for Definition of CCD). In some cases, the lack of a DSA approved CCD AND verification from the Inspector that a Notice of Non-Compliance has been corrected may result in a critical path delay to the next stage of Work on the Project. Specifically, a deviation from approved Plans and Specifications may prevent approval of the category of Work listed in the DSA 152 Project Inspection Card. Any delays that are caused by the Contractor's deviation from approved Plans and Specifications shall be the Contractor's responsibility.

7.1.3 Architect Authority

The Architect will have authority to order minor changes in the Work that do not involve DSA Approval not involving any adjustment in the Contract Sum, or an extension of the Contract Time.

7.2 CHANGE ORDERS ("CO")

A CO is a written instrument prepared by the Architect and signed by the District (as authorized by the District's Governing Board), the Contractor, and the Architect stating their agreement upon all of the following:

- a. A description of a change in the Work;
- b. The amount of the adjustment in the Contract Sum, if any; and
- c. The extent of the adjustment in the Contract Time, if any.

A CO may be comprised of ICD's, Response to RFP's and COR's

7.3 CONSTRUCTION CHANGE DOCUMENT (CCD Category A, and CCD Category B) and IMMEDIATE CHANGE DIRECTIVE (ICD)

7.3.1 Definitions

7.3.1.1 *Construction Change Document (CCD).* A Construction Change Document is a DSA term that is utilized to address changes to the DSA approved Plans and Specifications. There are two types of Construction Change Documents. (1) DSA approved CCD Category A for Work affecting structural, access compliance or fire/ life safety of the Project which will require a DSA approval; and, (2) CCD Category B for work NOT affecting structural safety, access compliance or fire/ life safety that will not require a DSA approval (except to confirm that no approval is required). Both CCD Category A and Category B shall be set forth in DSA Form 140 and submitted to DSA as required.

7.3.1.2 *Immediate Change Directive (ICD).* An Immediate Change Directive is a written order to the Contractor prepared by the Architect and signed by the District (and CM if there is a CM on the Project) and the Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The District may by ICD, without invalidating the Contract, direct immediate changes in the Work within the general scope of the Contract consisting of additions, deletions, or other

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revisions within. If applicable, the Contract Sum and Contract Time will be adjusted accordingly.

In the case of an Immediate Change Directive being issued, Contractor must commence Work immediately or delays from failure to perform the ICD shall be the responsibility of Contractor and the failure to move forward with Work immediately shall also be grounds for Termination under Article 14.

An ICD does not automatically trigger an Article 7.6 Dispute or Claim. Contractor must timely follow the procedures outlined at Article 7.6 and 4.6 where applicable.

Refer to Division 1 and Supplementary General Conditions for a copy of the proposed Immediate Change Directive form.

7.3.2 Use to Direct Change

An ICD shall be used to move work forward immediately and to avoid delay. In some cases, an ICD shall be issued in the absence of agreement on the terms of a CO, COR, or RFP. A copy of an ICD form is provided in the Supplementary General Conditions and Division 1. The anticipated not to exceed price for the Work will be inserted into the ICD. In the case of an ICD issued to correct Contractor Deficiencies or to correct a Contractor caused Notice of Non-Compliance, the ICD may be issued with \$0 and no additional time. Contract may prepare a COR associated with the ICD pursuant to Article 7. However, Contractor shall proceed with all Work required under an Approved ICD immediately upon issuance. Failure to proceed with the Work under an ICD shall be grounds for Termination for Cause under Article 14 or take over the Work under Article 2.2.

If adequate time exists, an ICD may be subject of an RFP for pricing and determination if any time that may be required. However, if an RFP is not completed, Contractor shall immediately commence Work when an ICD is issued. If the RFP is incomplete, it may still be completed to be submitted for pricing purposes as long as the RFP is submitted within the timeline provided by the RFP, or within 10 days following issuance of the ICD.

7.3.3 ICD Issued Over a Notice of Non-Compliance or to Cover Work Subject to a DSA 152 Sign Off

In some cases, an ICD shall be for the purpose of proceeding with Work to keep the Project on Schedule and as an acknowledgement by the District that Contractor is proceeding with Work contrary to a Notice of Non-Compliance, prior to issuance of a DSA approved CCD Category A, or to direct the covering of Work which has not yet received a DSA 152 Inspection Approval to move forward.

7.3.3.1 Contractor Compliance with all Aspects of an ICD. Contractor is to undertake the ICD and comply with all aspects of the Work outlined in the ICD. Inspector is to inspect the Work pursuant to the ICD. Failure to follow the ICD may result in deduction of the ICD Work under Article 2.2 or Termination of the Contractor pursuant to Article 14.

7.3.3.2 Exception in the Case of DSA Issued Stop Work Order. Contractor must proceed with an ICD even if a CCD has not been approved by DSA except in

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the case of a DSA issued Stop Work Order. If a DSA Stop Work Order is issued, Contractor must stop work and wait further direction from the District.

- 7.3.3.3 *ICD Due to Contractor Deficiency or Contractor Caused Notice of Non-Compliance.* If an ICD is issued to correct a Contractor Deficiency or a Contractor caused notice of Non-Compliance, Contractor specifically acknowledges responsibility for all consequential damages associated with the Contractor Deficiency or Contractor caused Notice of Non-Compliance and all consequential damages and costs incurred to correct the deficiency under Article 4.5

7.4 REQUEST FOR INFORMATION ("RFI")

7.4.1 Definition

A RFI is a written request prepared by the Contractor requesting the Architect to provide additional information necessary to clarify or amplify an item which the Contractor believes is not clearly shown or called for in the Drawings or Specifications, or to address problems which have arisen under field conditions.

- 7.4.1.1 A RFI shall not be used as a vehicle to generate time extensions.
- 7.4.1.2 Resubmission of the same or similar RFI is not acceptable. RFI's that are similar should be addressed in Project meetings where the requestor (Contractor, Subcontractor or vendor) is able to address the particular issue with the Architect or Engineer and a resolution addressed in the minutes.
- 7.4.1.3 A RFI response applicable to a specific area cannot be extended to other situations unless specifically addressed in writing within the RFI or in a separate RFI.
- 7.4.1.4 RFI's should provide a proposed solution and should adequately describe the problem that has arisen.

7.4.2 Scope

The RFI shall reference all the applicable Contract Documents including Specification section, detail, page numbers, Drawing numbers, and sheet numbers, etc. The Contractor shall make suggestions and interpretations of the issue raised by the RFI. An RFI cannot modify the Contract Cost, Contract Time, or the Contract Documents.

7.4.3 Response Time

The Architect must respond to a RFI within a reasonable time after receiving such request. If the Architect's response results in a change in the Work, then such change shall be effected by a written CO, COR RFP or ICD, if appropriate. If the Architect cannot respond to the RFI within a reasonable time, the Architect shall notify the Contractor, with a copy to the Inspector and the District, of the amount of time that will be required to respond.

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7.4.4 Costs Incurred

The Contractor shall be responsible for any costs incurred for professional services as more fully set forth in Article 4.5, which shall be subject to a Deductive Change Order, if an RFI requests an interpretation or decision of a matter where the information sought is equally available to the party making such request. District, at its sole discretion, shall issue a Deductive Change Order to Contractor for all such professional services arising from this Article.

7.5 REQUEST FOR PROPOSAL (“RFP”)

7.5.1 Definition

A RFP is a written request prepared by the Architect (and/or CM) requesting the Contractor to submit to the District and the Architect an estimate of the effect of a proposed change on the Contract Price and (if applicable) the Contract Time. If Architect issues a Bulletin, the Changed items in the Bulletin shall be addressed as an RFP and all responses shall be prepared to a Bulletin as addressed in this Article 7.5. A form RFP is included in the Division 1 documents.

7.5.2 Scope

A RFP shall contain adequate information, including any necessary Drawings and Specifications, to enable Contractor to provide the cost breakdowns required by Article 7.7. The Contractor shall not be entitled to any Additional Compensation for preparing a response to an RFP, whether ultimately accepted or not.

7.5.3 Response Time

Contractor shall respond to an RFP within ten (10) days or the time period otherwise set forth in the RFP.

7.6 CHANGE ORDER REQUEST (“COR”)

7.6.1 Definition

A COR is a written request prepared by the Contractor supported by backup documentation requesting that the District and the Architect issue a CO based upon a proposed change, cost, time, or cost and time that may be incurred on the Project or arising from an RFP, ICD, or CCD.

7.6.2 Changes in Price

A COR shall include breakdowns per Article 7.7 to validate any change in Contract Price due to proposed change or Claim.

7.6.3 Changes in Time

A COR shall also include any additional time required to complete the Project only if the delay is a critical path delay. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Project

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Schedule as defined in Article 8. A schedule fragnet showing the time delay must be submitted with the COR. Any changes in time will be granted only if there is an impact to the critical path. If Contractor fails to request a time extension in a COR, then the Contractor is thereafter precluded from requesting or claiming a delay.

7.7 COST OF CHANGE ORDERS

7.7.1 Scope

Within ten (10) days after a request is made for a change that impacts the Contract Sum as defined in Article 9.1, the critical path, or the Contract Time as defined in Article 8.1.1, the Contractor shall provide the District and the Architect, with a written estimate of the effect of the proposed CO upon the Contract Sum and the actual cost of construction, which shall include a complete itemized cost breakdown of all labor and material showing actual quantities, hours, unit prices, and wage rates required for the change, and the effect upon the Contract Time of such CO. Changes may be made by District by an appropriate written CO, or, at the District's option, such changes shall be implemented immediately upon the Contractor's receipt of an appropriate written Construction Change Document.

District may, as provided by law and without affecting the validity of this Agreement, order changes, modification, deletions and extra work by issuance of written CO or CCD from time to time during the progress of the Project, Contract Sum being adjusted accordingly. All such Work shall be executed under conditions of the original Agreement except that any extension of time caused thereby shall be adjusted at time of ordering such change. District has discretion to order changes on a "time and material" basis with adjustments to time made after Contractor has justified through documentation the impact on the critical path of the Project.

7.7.1.1 *Time and Material Charges.* If the District orders Work on a "time and material" basis, timesheets shall be signed daily by the Inspector or District Representative at or near the time the Work is actually undertaken and shall show the hours worked, and the Work actually completed. No time sheets shall be signed the next day. A copy shall be provided to the Person signing the document at the time the document is signed, but not before 10 am the following day.

7.7.2 Determination of Cost

The amount of the increase or decrease in the Contract Price from a CO or COR, if any, shall be determined in one or more of the following ways as applicable to a specific situation:

- a. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation. If an agreement cannot be reached within fifteen (15) days after submission and negotiation of Contractor's proposal, Contractor may submit pursuant to Article 7.7.3. Submission of sums which have no basis in fact are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq.);

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1. If the District objects to 7.7.2(a) as a method for submission due to inaccuracies in the submitted amount, overstatement of manpower or time required to perform the CO, or unreliability of the data provided, the District may either have the Architect or a professional estimator determine the cost for the CO, and the applicable time extension, or the Contractor shall utilize Article 7.7.2(d) or 7.7.3.
 2. Once the District provides a written objection to use of Article 7.7.2(a) due to unreliability of the estimated price, the Contractor shall no longer utilize mutual acceptance of a lump sum as a method for submission of CO's and shall provide a breakdown of estimated or actual costs pursuant to Article 7.7.2(d) or 7.7.3
- b. By unit prices contained in Contractor's original bid and incorporated in the Project documents or fixed by subsequent agreement between District and Contractor;
 - c. Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee. However, in the case of disagreement, Contractor must utilize the procedure under Article 7.7.3; or
 - d. By cost of material and labor and percentage of overhead and profit. If the value is determined by this method the following requirements shall apply:
 1. *Basis for Establishing Costs*
 - (1) Labor will be the cost for wages prevailing locally for each craft or type of workers at the time the extra Work is done, plus employer payments of payroll taxes and workers compensation insurance (exclude insurance costs as part of the overhead and profit mark-up), health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. In no case shall the total labor costs exceed the applicable prevailing wage rate for that particular classification. The use of a labor classification which would increase the extra Work cost will not be permitted unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.
 - (2) Materials shall be at invoice or lowest current price at which such materials are locally available and delivered to the Site in the quantities involved, plus sales tax, freight, and delivery. The District reserves the right to approve materials and sources of supply or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the District.

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- (3) Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of \$250 or less.

Regardless of ownership, the rates to be used in determining equipment rental costs shall not exceed listed rates prevailing locally at equipment rental agencies or distributors at the time the Work is performed. Rates applied shall be appropriate based on actual equipment need and usage. Monthly, weekly or other extended use rates that results in the lowest cost shall be applied if equipment is used on site for extended periods.

The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.

Necessary loading and transportation costs for equipment used on the extra Work shall be included. If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the District than holding it at the Work Site, it shall be returned unless the Contractor elects to keep it at the Work Site at no expense to the District.

All equipment shall be acceptable to the Inspector, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and modifications shall be used to classify equipment, and equipment shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

If tool and equipment charges are part of a Dispute or Claim, the District reserves the right to utilize actual costs for tools and equipment or a depreciation rate for equipment based on audit finding under Article 13.11 and deduct any rental charges that exceed actual or depreciated costs.

- e. Other Items. The District may authorize other items which may be required on the extra work. Such items include labor, services, material, and equipment which are different in their nature from those required by the Work, and which are of a type not ordinarily available from the Contractor or any of the Subcontractors. Invoices covering all such items in detail shall be submitted with the request for payment.
- f. Invoices. Vendors' invoices for material, equipment rental, and other expenditures shall be submitted with the COR. If the request for payment is not substantiated by invoices or other documentation, the District may establish the cost of the item involved at the lowest price which was current at the time of the Daily Report.
- g. Overhead. Overhead, including direct and indirect costs, shall be submitted with the COR and include: field overhead, home office overhead, off-site supervision, CO preparation/negotiation/research, time delays, Project interference and disruption, additional guaranty and warranty durations, on-site supervision, additional temporary protection, additional temporary utilities, additional material

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handling costs, liability and property damage insurance, and additional safety equipment costs.

7.7.3 Format for COR or CO's

The following format shall be used as applicable by the District and the Contractor to communicate proposed additions to the Contract. All costs submitted shall be actual costs and labor shall be unburdened labor. Refer to Division 1 for a copy of the Construction Change Order form.

		<u>EXTRA</u>	<u>CREDIT</u>
(a)	Material (attach itemized quantity and unit cost plus sales tax)		
(b)	Labor Not to Exceed Applicable Prevailing Wage Rates (attach itemized hours and rates)		
(c)	Equipment (attach invoices)		
(d)	Subtotal		
(e)	If Subcontractor performed work, add Subcontractor's overhead and profit to portions performed by Subcontractor, not to exceed 10% of item (d).		
(f)	Subtotal		
(g)	Contractor's Overhead and Profit: Not to exceed 10% of Item (d) if Contractor performed the work. No more than 5% of Item (d) if Subcontractor performed the work. If work was performed by Contractor and Subcontractors, portions performed by Contractor shall not exceed 10% of Item (d), and portions performed by Subcontractor shall not exceed 10% of Item (d).		
(h)	Subtotal		
(i)	Bond not to exceed one percent (1%) of Item (h)		
(k)	TOTAL		
(l)	Time/ Days		

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The undersigned Contractor approves the foregoing Change Order or Immediate Change Directive as to the changes, if any, and the Contract price specified for each item and as to the extension of time allowed, if any, for completion of the entire Work on account of said Change Order or Immediate Change Directive, and agrees to furnish all labor, materials and service and perform all Work necessary to complete any additional Work specified therein, for the consideration stated herein. It is understood that said Change Order or Immediate Change Directive shall be effective when approved by the Governing Board of the District.

It is expressly understood that the value of such extra Work or changes, as determined by any of the aforementioned methods, expressly includes any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages or time extensions not included are deemed waived.

The Contractor expressly acknowledges and agrees that any change in the Work performed shall not be deemed to constitute a delay or other basis for claiming additional compensation based on theories including, but not limited to, acceleration, suspension or disruption to the Project.

7.7.3.1 *Adjustment for Time and Compensable Delay.* A CO shall also include any additional time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Project Schedule as defined in Article 8 of the General Contract. A schedule fragnet showing the time delay must be submitted with the CO. Any changes in time will be granted only if there is an impact to the critical path. If Contractor fails to request a time extension in a CO, then the Contractor is thereafter precluded from requesting or claiming a delay.

7.7.4 Deductive Change Orders

All Deductive Change Order(s) must be prepared utilizing the form under Article 7.7.3 (a) – (d) only, setting forth the actual costs incurred. Except in the case of an Article 2.2 or 9.6 Deductive Change Order where no mark-up shall be allowed, Contractor will be allowed a maximum of 5% total profit and overhead.

For unilateral Deductive Change Orders, or where credits are due from Contractor for Allowances, Deductive Items, Inspection, Damage, DSA CCD review costs, Architect or Inspector costs for after hours or corrective services, Work removed from the Agreement under Article 2.2 or Article 9.6, there shall be no mark-up.

District may, any time after a Deductive Change Order is presented to Contractor by District for items under Article 2.2 or Article 9.6 or if there is disagreement as to the Deductive Change Order, issue a unilateral Deductive Change Order on the Project and deduct the Deductive Change Order from a Progress Payment, Final Payment, or Retention.

7.7.5 Discounts, Rebates, and Refunds

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the Contractor's cost

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in determining the actual cost of construction for purposes of any change, addition, or omissions in the Work as provided herein. All CO's are subject to Audit under Article 13.11 for discounts, rebates and refunds.

7.7.6 Accounting Records

With respect to portions of the Work performed by CO's and CCD's on a time-and-materials, unit-cost, or similar basis, the Contractor shall keep and maintain cost-accounting records in a format consistent with accepted accounting standards and satisfactory to the District, which shall be available to the District on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

Any time and material charges shall require Inspector's signature on time and material cards showing the hours worked and the Work actually completed. (See Article 7.7.1.1)

7.7.7 Notice Required

If the Contractor desires to initiate a Dispute or Claim for an increase in the Contract Price, or any extension in the Contract Time for completion, Contractor shall notify the applicable party responsible for addressing the Dispute or Claim pursuant to Article 4.6. No Claim or Dispute shall be considered unless made in accordance with this subparagraph. Contractor shall proceed to execute the Work even though the adjustment may not have been agreed upon. Any change in the Contract Price or extension of the Contract Time resulting from such Claim shall be authorized by a CO.

7.7.8 Applicability to Subcontractors

Any requirements under this Article 7 shall be equally applicable to CO's, COR's or ICD's issued to Subcontractors by the Contractor to the same extent required by the Contractor.

7.7.9 Alteration to Change Order Language

Contractor shall not alter or reserve time in COR's, CO's or ICD's. Contractor shall execute finalized CO's and proceed under Article 7.7.7 and Article 4.6 with proper notice. If Contractor intends to reserve time without an approved CPM schedule prepared pursuant to Article 8 or without submitting a fragnet showing delay to critical path, then Contractor may be prosecuted pursuant to the False Claim Act.

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ARTICLE 8 TIME AND SCHEDULE

8.1 DEFINITIONS

8.1.1 Contract Time

Contractor shall perform and reach Substantial Completion (See Article 1.1.46) within the time specified in the Agreement Form. Moreover, Contractor shall perform its Work in strict accordance with the Project Milestones in the Contract Documents and shall proceed on a properly developed and approved Baseline Schedule, which represents the Contractor's view of the practical way in which the Work will be accomplished. Note that Contract Time includes and incorporates all Float and other Baseline inclusions as noted in Article 8.3.2.1 and as otherwise specifically noted in Article 8.

8.1.2 Notice to Proceed

District may give a Notice to Proceed within ninety (90) days of the award of the bid by District. Once Contractor has received the notice to proceed, Contractor shall complete the Work in the period of time referenced in the Contract Documents.

In the event that District desires to postpone the giving of the Notice to Proceed beyond this three-month period, it is expressly understood that with reasonable notice to the Contractor, the giving of the date to proceed may be postponed by District. It is further expressly understood by Contractor, that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the giving of the notice to proceed

If the Contractor believes that a postponement will cause a hardship to Contractor, Contractor may terminate the Contract with written notice to District within 10 days after receipt by Contractor of District's notice of postponement. It is further understood by Contractor that in the event that Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement and the grounds for notification and hardship shall be subject to Audit pursuant to Article 13.11. Should Contractor terminate the Contract as a result of a notice of postponement, District may award the Contract to the next lowest responsible bidder.

8.1.3 Computation of Time

The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.1.4 Float

Float is time the total number of days an activity may be extended or delayed without delaying the Completion Date shown in the schedule. Float will fall into three categories: (1) Rain Days; (2) Governmental Delays; and, (3) Project Float. Project Float and Rain Days are owned by the Project and may be utilized as necessary for critical path delays

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once the days become available for consumption (i.e. the Rain Day arrives and is not utilized since rain did not occur or Work was performed on the interior of a building). However, Governmental Delay float shall not be utilized for purposes other than to address critical path delays that arise due to approvals, Inspector approvals or verifications on governmental forms.

8.1.4.1 *Governmental Delay Float.* It is anticipated that there will be governmental generated delays. Specific to DSA approvals, it is anticipated that no less than twelve (12) days per calendar year shall be set aside as Governmental Float to be utilized on critical path delays. A pro-rated number of days shall be calculated based on length of Contract Time. (For example, a two (2) year Contract Time shall require twenty-four (24) days of Governmental Float. If the Contract Time is 182 days, then the Contract Time shall require six (6) days of Governmental Float) This Governmental Delay float must be incorporated into the schedule and should be incorporated in each critical activity as Contractor deems fit. Specifically, major categories of Work under the DSA 152 (Project Inspection Card) should be allocated Governmental Delay Float at the Contractor's discretion. Governmental Delay Float on the Project may exceed 12 days per one (1) year period, but Contractor is required to include not be less than 12 days of Governmental Delay Float during each one (1) year period.

Contractor's failure to establish a protocol for requesting inspections is not grounds to utilize Governmental Delay Float. As noted in Article 3.1.4, 48 hours advance notice of commencing Work on a new area is required after submitting form DSA 156 and under PR 13-01 Special Inspection reports are not required to be posted until at least 14 days after the Work was inspected. Failure to plan, and pay (if applicable) for quicker delivery of Special Inspections is not Governmental Delay Float under Article 8.1.4.1. If Governmental Delay Float is not utilized, this float is carried through to other DSA 152 categories of inspection and consumed over the course of the Project

Governmental Delay Float may be utilized for a DSA Stop Work Order regardless of fault as defined under Education Code section 17307.5(b).

8.1.4.2 *Inclement Weather (Rain Days).* The Contractor will only be allowed a time extension for unusually severe weather if it results in precipitation or other conditions which in the amount, frequency, or duration is in excess of the norm at the location and time of year in question as established by NOAA weather data. No less than 22 calendar days for each calendar year for Southern California will be allotted for in the Contractor's schedule for each winter weather period or carried at the end of the schedule as Rain Float. Float for weather days in other geographical regions shall be adjusted based on NOAA weather data for the geographical location. Contractor has anticipated all the days it takes to dry out and re-prepare areas that may be affected by weather delays which extend beyond the actual weather days. The weather days shall be shown on the schedule and if not used will become float for the Project's use. The Contractor will not be allowed a day-for-day weather delay for periods noted as float in the Schedule. The Contractor is expected to work seven (7) days per week (if necessary, irrespective of inclement weather), to maintain access, and to protect the Work under construction from the effects of inclement weather. Additional days beyond the

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NOAA shall be considered under the same criteria that weather days are granted below.

A Rain Day shall be granted by Architect or CM if the weather prevents the Contractor from beginning Work at the usual daily starting time, or prevents the Contractor from proceeding with seventy-five (75%) of the normal labor and equipment force towards completion of the day's current controlling item on the accepted schedule for a period of at least five hours, and the crew is dismissed as a result thereof, the Architect will designate such time as unavoidable delay and grant one (1) critical path activity calendar-day extension if there is no available float for the calendar year.

8.1.4.3 *Project Float.* The Contractor may determine some activities require a lesser duration than allocated and may set aside float in the Project Schedule. There shall be no early completion. Instead, to the extent float is either addressed at the end of the Project or throughout each category of critical path work, Project float may be used as necessary during the course of the Project and allocated on a first, come first serve basis. However, the use of float does not extend to Governmental Delay Float, which shall only be used for Governmental Delays.

8.2 HOURS OF WORK

8.2.1 Sufficient Forces

Contractors and Subcontractors shall continuously furnish sufficient forces to ensure the prosecution of the Work in accordance with the Construction Schedule.

8.2.2 Performance During Working Hours

Work shall be performed during regular working hours as permitted by the appropriate governmental agency except that in the event of an emergency, or when required to complete the Work in accordance with job progress, Work may be performed outside of regular working hours with the advance written consent of the District and approval of any required governmental agencies.

8.2.3 Costs for After Hours Inspections

If the Work done after hours is required by the Contract Documents, a Recovery Schedule, or as a result of the Contractor's failure to plan, and inspection must be conducted outside the Inspector's regular working hours, the costs of any after hour inspections, shall be borne by the Contractor.

If the District allows the Contractor to do Work outside regular working hours for the Contractor's convenience, the costs of any inspections required outside regular working hours shall be invoiced to the Contractor by the District and a Deductive Change Order shall be issued from the next Progress Payment.

If the Contractor elects to perform Work outside the Inspector's regular working hours, costs of any inspections required outside regular working hours shall be invoiced to the Contractor by the District and a Deductive Change Order from the next Progress Payment as a Deductive Change Order.

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8.3 PROGRESS AND COMPLETION

8.3.1 Time of the Essence

Time limits stated in the Contract Documents are of the essence to the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.3.2 Baseline Schedule Requirements

8.3.2.1 *Timing:* Within ten (10) calendar days after Notice to Proceed, Contractor shall submit a practical schedule showing the order in which the Contractor proposes to perform the Work, and the dates on which the Contractor contemplates starting and completing the salient categories of the Work. This first schedule which outlines the Contractor's view of the practical way in which the Work will be accomplished is the Baseline Schedule. If the Contractor Fails to submit the Baseline Schedule within the ten (10) days noted, then District may withhold processing and approval of progress payments pursuant to Article 9.4 and 9.6.

8.3.2.2 *District Review and Approval:* District, Architect and CM will review both a paper and electronic copy of Baseline Schedule and may provide comments as noted in this Article and either approve or disapprove the Baseline Schedule. All Schedules shall be prepared using an electronic scheduling program acceptable to District. All Schedules shall be delivered in an electronic format usable by the District. All logic ties and electronic information shall be included in the electronic copy of the Baseline Schedule that is delivered to the District.

8.3.2.3 *Schedule Must Be Within the Given Contract Time.* The Baseline Schedule shall not exceed time limits set forth in the Contract Documents and shall comply with all of the scheduling requirements as set forth in the Specifications and Contract Documents.

8.3.2.4 *Submittals Must Be Incorporated (See Articles 3.7 and 3.9):* Contractor shall include Submittals as line items in the Baseline Schedule as required under Article 3.7.2 and 3.9.6. Submittals shall not delay the Work, Milestones, or the Completion Date. Failure to include Submittals in the Baseline Schedule shall be deemed a material breach by the Contractor.

8.3.2.5 *Float Must Be Incorporated.* The Baseline Schedule must indicate the beginning and completion of all phases of construction and shall use the "critical path method" (commonly called CPM) for the value reporting, planning and scheduling, of all Work required under the Contract Documents. The Baseline Schedule must incorporate all Milestones in the Project and apply Governmental Float at each Milestone in the Contractor's discretion. The Baseline Schedule shall incorporate any Schedule provided by the District as part of the bid and shall note durations that will not be adequate or should be shortened based on Contractor's review. These changes shall be identified and incorporated into Contractor's Baseline Schedule as long as requested changes

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are made within 10 days after the District chooses to move forward with the Project. Scheduling is necessary for the District's adequate monitoring of the progress of the Work and shall be prepared in accordance with the time frame described in this Article 8. The Architect may disapprove of any Schedule or require modification to it if, in the opinion of the Architect or District, adherence to the any Schedule prepared by the Contractor will not cause the Work to be completed in accordance with the Agreement.

- 8.3.2.6 *No Early Completion.* Contractor shall not submit any Schedule showing early completion without indicating float time through the date set for Project completion by District. Contractor's Baseline Schedule shall account for all days past early completion as float which belongs to the Project. Usage of float shall not entitle Contractor to any delay Claim or damages due to delay.
- 8.3.2.7 *Use of Schedule Provided in Bid Documents.* In some cases, the bid will include a preliminary schedule indicating Milestones and construction sequences for the Project along with general timing for the Project. The preliminary schedule is not intended to serve as the Baseline Schedule utilized for construction. It is up to the Contractor to study and develop a Baseline Schedule to address the actual durations and sequences of Work that is anticipated while maintaining the Milestones provided by the District. Contractor shall obtain information from Contractor's Subcontractors and vendors on the planning, progress, delivery of equipment, coordination, and timing of availability of Subcontractors so a practical plan of Work is fully developed and represented in the Baseline Schedule.
- 8.3.2.8 *Incorrect Logic, Durations, Sequences, or Critical Path.* The District may reject or indicate durations, sequences, critical path or logic are not acceptable and request changes. The electronic copy of the Baseline Schedule shall have adequate information so logic ties, duration, sequences and critical path may be reviewed electronically. Contractor is to diligently rebuild and resubmit the Baseline Schedule to represent the Contractor's plan to complete the Work and maintain Milestones at the next progress meeting, or before the next progress meeting. If Contractor is not able to build a Baseline Schedule that is acceptable to the District or Architect, the District reserves the right to utilize the unapproved originally submitted Baseline Schedule (See Article 8.3.2.12) and the comments submitted to hold Contractor accountable for timely delivery of Work and maintenance of Milestones. Furthermore, Contractor's representations in the Baseline Schedule, if unacceptable, may also be used as a basis for termination of the Contract under Article 14 if Contractor fails to adequately maintain the Schedule and falls significantly behind without undertaking the efforts to either submit and follow a Recovery Schedule or fail to submit a Recovery Schedule and make no effort toward recovery on the Project.
- 8.3.2.9 *Contractor Responsibility Even if Schedule Issues Are Not Discovered.* Failure on the Part of the District to discover errors or omissions in any Schedules submitted shall not be construed to be an approval of the error or omission and any flawed Schedule is not grounds for a time extension.

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8.3.2.9 Inclusions in Baseline Schedule. In addition to scheduling requirements set forth at Article 8.3.2, Contractor is specifically directed to include (broken out separately) in Contractor's Baseline Schedule and all Schedule updates, the following items required pursuant to these General Conditions, including but not limited to:

1. Rain Day Float (excluding inclement weather) as required under Article 8.1.4.2. For example, if the NOAA provides 22 days of Rain Days, all 22 days must be incorporated and noted in the Baseline Schedule. Further, any days required to clean-up or dry out shall be included for operations that are likely to require a clean-up or dry out period. Days that are not utilized shall be considered float owned by the Project.
2. Governmental Delay Float under Article 8.1.4.1. This Governmental Delay Float shall only be utilized for Governmental Delays and shall not be considered available float owned by the Project. This float shall only be distributed to the Project upon the completion of the Project and shall be used to offset Liquidated Damages and shall not generate compensable delays.
3. Submittal and Shop Drawing schedule under Article 3.9.
4. Deferred Approvals under Article 3.9.
5. Time for separate contractors, including furniture installation and start up activities, under Article 6.1.
6. Coordination and timing of any Drawings, approvals, notifications, permitting, connection, and testing for all utilities for the Project. (See Article 2.1.4).
7. Testing, special events, or school activities

8.3.2.10 *Failure to include Mandatory Schedule Items.* District may withhold payment pursuant to Articles 9.3, 9.4 and 9.6. In lieu of withholding payment for failure to include Mandatory Schedule Items, after the District or Architect has notified the Contractor of failure to meet the Baseline Schedule or Updated Schedule requirements and provided a written notification of this failure and provided a written notice of Schedule preparation errors, and the Contractor fails to correct the noted deficiencies or the Contractor does not provide an updated Baseline Schedule correcting the deficiencies, then Contractor shall not be granted an extension of time for failure to obtain necessary items and approvals under Article 8.3.2 and for the time required for failure to comply with laws, building codes, and other regulations (including Title 24 of the California Code of Regulations). Contractor shall maintain all required Article 8.3.2 Schedule items in the Baseline Schedule and indicate any days that have been used as allowed in Article 8. If Contractor fails to include all Article 8.3.2 items in its Baseline Schedule or Schedule Updates and the District either utilizes an Unapproved Schedule under Article 8.3.2.12 or does not object to the inclusion of required scheduling items, then all mandatory Schedule

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inclusions, including float, shall be utilized in the District's discretion. If the Contract Time is exceeded, then Contractor shall be subject to the assessment of Liquidated Damages pursuant to Article 8.4.

- 8.3.2.11 *Failure to Meet Requirements.* Failure of the Contractor to provide proper Schedules as required by this Article and Article 9 is a material breach of the Contract and grounds for Termination pursuant to Article 14. The District, at its sole discretion, may choose, instead, to withhold, in whole or in part, any Progress Payments or Retention amounts otherwise payable to the Contractor.
- 8.3.2.12 *Use of an Unapproved Baseline Schedule.* If the Baseline Schedule submitted by the Contractor is unacceptable to the District (i.e. failing to meet the requirements of Article 8.3.2) and Contractor does not incorporate or address the written comments to the Baseline Schedule and a Baseline Schedule is not approved, but due to extreme necessity, the District moves forward without an approved Baseline Schedule, Contractor shall diligently revise and meet Schedule update requirements of Article 8 and incorporate all Article 8.3.2 comments in all updates). However, for purposes of Termination pursuant to Article 14, the unapproved Baseline Schedule initially submitted shall be treated as the Baseline Schedule with durations shortened or revised to accommodate all float, all mandatory Schedule requirements under Article 8.3.2, any requirements in the Contract Documents, and all revisions by the District or Architect.

8.3.3 Update Schedules

- 8.3.3.1 *Updates Shall Be Based on Approved Baseline Schedule.* Except in the case where there has not been agreement as to a Baseline Schedule, the approved Baseline Schedule shall be used to build future Schedule updates. Schedule updates shall be a CPM based Schedule consistent with the Baseline Schedule requirements of 8.3.2

In the case that no Baseline has been approved, Schedule updates shall be provided monthly and each update shall incorporate all comments and revisions noted as not complying with the requirements of Article 8.3.2. Contractor shall be held to the Article 8.3.2.12 unapproved Baseline Schedule, inclusive of all Milestones, float, comments and revisions by the District and Architect, all required Baseline Schedule Inclusions under Article 8.3.2, and any requirements in the Contract Documents.

- 8.3.3.2 *Schedule Updates.* Contractor shall update the approved Schedule each month to address actual start dates and durations, the percent complete on activities, actual completion dates, estimated remaining duration for the Work in progress, estimated start dates for Work scheduled to start at future times and changes in duration of Work items
- 8.3.3.3 *Listing of Items Causing Delays.* Schedule updates shall provide a listing of activities which are causing delay in the progress of Work and a narrative shall be provided showing a description of problem areas, anticipated delays, and impacts on the Construction Schedule. Simply stating "District Delay" or

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"Architect Delay" shall be an inadequate listing. Delays shall only be listed if they meet the requirements of Article 8.4.

8.3.3.4 *Recovery Schedule.* In addition to providing a schedule update every thirty (30) days, the Contractor, if requested by the Architect or District, shall take the steps necessary to improve Contractor's progress and demonstrate to the District and Architect that the Contractor has seriously considered how the lost time, the Completion Date, or the Milestones that are required to be met within the terms of the Contract. Contractor shall immediately provide a Recovery Schedule showing how Milestones and the Completion Date will be met. In no case, shall a Recovery Schedule be provided later than ten (10) days following the request for a Recovery Schedule from the Architect or District.

- a. Failure to Provide a Recovery Schedule. Shall subject Contractor to the assessment of Liquidated Damages for failure to meet the Contract Time. Refusal or failure to provide a Recovery Schedule shall be considered a substantial failure of performance and a material breach of Contract and may result in Termination of the Contract pursuant to Article 14.
- b. Recovery Schedule Acceleration without Additional Cost. The District may require Contractor prepare a Recovery Schedule showing how the Project shall be accelerated, without any additional cost to the District. The District may order, without additional cost, the following:
 - 1. Increase the number of shifts;
 - 2. Utilize overtime to recover the approved Schedule; and/or
 - 3. Increase the days when Work occurs, including weekends, at the Project and at any manufacturer's plant.
- c. Recovery Schedule Acceleration without Additional Cost. If Contractor disputes that the Recovery Schedule acceleration shall be issued without additional costs, the Contractor shall submit concurrent with Recovery Schedule acceleration notice pursuant to Articles 8.4.3 and 8.4.4.

8.4 EXTENSIONS OF TIME - LIQUIDATED DAMAGES

8.4.1 Liquidated Damages

CONTRACTOR AND DISTRICT HEREBY AGREE THAT THE EXACT AMOUNT OF DAMAGES FOR FAILURE TO COMPLETE THE WORK WITHIN THE TIME SPECIFIED IS EXTREMELY DIFFICULT OR IMPOSSIBLE TO DETERMINE. IF THE WORK IS NOT SUBSTANTIALLY COMPLETED IN THE TIME SET FORTH IN THE AGREEMENT, IT IS UNDERSTOOD THAT THE DISTRICT WILL SUFFER DAMAGES. IT BEING IMPRACTICAL AND UNFEASIBLE TO DETERMINE THE AMOUNT OF ACTUAL DAMAGE, IT IS AGREED THE CONTRACTOR SHALL PAY TO THE DISTRICT THE AMOUNT LIQUIDATED DAMAGES SET FORTH IN THE AGREEMENT, FOR EACH CALENDAR DAY OF DELAY IN REACHING SUBSTANTIAL COMPLETION (SEE ARTICLE 1.1.46). CONTRACTOR AND ITS

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SURETY SHALL BE LIABLE FOR THE AMOUNT THEREOF PURSUANT TO GOVERNMENT CODE SECTION 53069.85.

8.4.2 Delay

Except and only to the extent provided under Article 7 and Article 8, by signing the Agreement, Contractor agrees to bear the risk of delays to Completion of the Work and that Contractor's bid for the Project was made with full knowledge of this risk.

In agreeing to bear the risk of delays to complete the Work, Contractor understands that, except and only to the extent provided otherwise in Article 7 and 8, the occurrence of events that delay the Work shall not excuse Contractor from its obligation to achieve Completion of the Project within the Contract Time, and shall not entitle the Contractor to an adjustment to the Contract time.

8.4.3 Excusable Delay

Contractor shall not be charged for Liquidated Damages because of any delays in completion of Work which are not the fault or negligence of Contractor or its Subcontractors, arising from Rain Float or Project Float, including acts of God, as defined in Public Contract Code section 7105, acts of enemy, epidemics and quarantine restrictions. Contractor shall within five (5) calendar days of beginning of any such delay notify District in writing of causes of delay; thereupon District shall ascertain the facts and extent of delay and grant extension of time for completing Work when, in its judgment, the findings of fact justify such an extension. Extensions of time shall apply only to that portion of Work affected by delay, and shall not apply to other portions of Work not so affected. An extension of time may only be granted after proper compliance with Article 8.3 requiring preparation and submission of a properly prepared CPM schedule.

8.4.3.1 *Excusable Delay Is Not Compensable.* No extended overhead, general conditions costs, impact costs, out-of-sequence costs or any other type of compensation, by any name or characterization, shall be paid to the Contractor for any delay to any activity not designated as a critical path item on the latest approved Project schedule.

8.4.3.2 *Notification.* The Contractor shall notify the Architect in writing of any anticipated delay and its cause, in order that the Architect may take immediate steps to prevent, if possible, the occurrence or continuance of delay, and may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work might be delayed thereby.

8.4.3.3 *Extension Request.* In the event the Contractor requests an extension of Contract time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in Work (See Article 7). When requesting time, i.e., extensions, for proposed Change Orders, they must be submitted with the proposed Change Order with full justification and documentation. If the Contractor fails to submit justification with the proposed Change Order it waives its right to a time extension at a later date. Such justification must be based on the official

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Contract schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the scope of Work. Blanket or general claims for extra days without specific detailed information as required herein or a blanket or general reservation of rights do not fulfill the requirements of this Article and shall be denied. The justification must include, but is not limited to, the following information:

- a. The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform these activities within the stated duration.
- b. Logical ties to the official Baseline Schedule or Approved Updated Schedule for the proposed changes and/or delay showing the activity/activities in the schedule whose start or completion dates are affected by the change and/or delay. (A fragnet of any delay of over ten (10) days must be provided.)

The Contractor and District understand and expressly agree that insofar as Public Contract Code section 7102 may apply to changes in the Work or delays under this Contract, the actual delays and damages, if any, and time extensions are intended to, and shall provide, the exclusive and full method of compensation for changes in the Work and construction delays.

8.4.4 Notice by Contractor Required

The Contractor shall within five (5) calendar days of beginning of any such delay notify the District in writing of causes of delay with justification and supporting documentation. In the case of a Recovery Schedule pursuant to Article 8.3.3.4, Contractor shall submit written notice concurrent with the Recovery Schedule. District will then ascertain the facts and extent of the delay and grant an extension of time for completing the Work when, in its judgment, the findings of fact justify such an extension. Extensions of time shall apply only to that portion of the Work affected by the delay and shall not apply to other portions of the Work not so affected.

Claims relating to time extensions shall be made in accordance with applicable provisions of Article 7.

8.4.4.1 *Adjustment for Compensable Delays.* The Schedule may be adjusted for a delay if, and only if, Contractor undertakes the following:

- a. Contractor submits a timely COR or CO pursuant to the requirements of Article 7.
- b. Contractor submits a fragnet showing the critical path delay caused by the COR, CO, Changed Condition, CCD, or ICD
- c. Contractor has addressed all required float days in the Fragnet.
- d. Contractor submits a complete breakdown of all costs incurred utilizing the format of Article 7.3.3

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8.4.5 No Additional Compensation for Coordinating Governmental Submittals and the Resulting Work

CONTRACTOR HAS PLANNED ITS WORK AHEAD OF TIME AND IS AWARE THAT GOVERNMENTAL AGENCIES, SUCH AS THE GAS COMPANIES, ELECTRICAL UTILITY COMPANIES, WATER DISTRICTS AND OTHER AGENCIES MAY HAVE TO APPROVE CONTRACTOR PREPARED DRAWINGS OR APPROVE A PROPOSED INSTALLATION. CONTRACTOR HAS INCLUDED DELAYS AND DAMAGES WHICH MAY BE CAUSED BY SUCH AGENCIES IN CONTRACTOR'S BID AND HAS INCLUDED ADEQUATE TIME IN THE CONTRACTOR'S BASELINE SCHEDULE. FAILURE TO ADEQUATELY PLAN AND SCHEDULE IS NOT A BASIS TO USE GOVERNMENTAL DELAY FLOAT.

8.4.6 District Right to Accelerate the Work

The District may direct the Contractor to meet schedule requirements when the Work has been delayed. The District shall compensate the Contractor for the additional costs incurred by acceleration to the extent that such costs are directly attributable to the acceleration and are incurred through no fault or negligence of the Contractor.

8.4.6.1 *Management of Acceleration.* Contractor acceleration shall not include Work that is part of the scope of Work detailed in the Plans and Specifications. Instead, the acceleration costs shall be premium or overtime and quantifiable additional work added to the Project meant to accelerate the Project. Contractor is directed to keep consistent crews on the Project so time can be tracked. If crews are circulated off the Project or crews brought in only for overtime, the District may be charged for Contract Work and not accelerated time. In such case, the District may object to the costs submitted.

8.4.6.2 *Costs for Acceleration.* Cost for Acceleration shall be supported by backup documentation, and time sheets signed by the Inspector for each day work has been performed, at or near the time when the Work was performed. A listing on the time sheet shall document all labor, materials and services utilized that day and provide areas of work, and amount of work performed. Contractor shall comply with submission requirements of Article 7.7.

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ARTICLE 9 PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

The Contract Sum or Contract Price is stated in the Agreement and, including authorized adjustments, is the total amount payable by the District to the Contractor for performance of the Work under the Contract Documents.

9.2 COST BREAKDOWN

9.2.1 Required Information

Contractor shall furnish the following:

- a. Within ten (10) days after Notice to Proceed, a detailed breakdown of the Contract Price (hereinafter "Schedule of Values") for each Project, Site, building, Milestone or other meaningful method to measure the level of Project Completion as determined by the District shall be submitted as a Submittal for the Project.;
- b. Within ten (10) days after the date of the Notice to Proceed, a schedule of estimated monthly payment requests due the Contractor showing the values and construction time of the various portions of the Work to be performed by it and by its Subcontractors or material and equipment suppliers containing such supporting evidence as to its correctness as the District may require;
- c. Within ten (10) days after the date of the Notice to Proceed, address, telephone number, telecopier number, California State Contractors License number, classification and monetary value of all subcontracts for parties furnishing labor, material, or equipment for completion of the Project.

9.2.2 Information and Preparation of Schedule of Values

- 9.2.2.1 *Break Down of Schedule of Values.* Schedule of Values shall be broken down by Project, site, building, Milestone, or other meaningful method to measure the level of Project Completion as determined by the District.
- 9.2.2.2 *Based on Contractor Bid Costs.* The Schedule of Values shall be based on the costs from Contractor's bid to the District. However, the submission of the Schedule of Values shall not be front loaded so the Contractor is paid a greater value than the value of the Work actually performed and shall not shift funds from parts of the Project that are later to Work that is performed earlier.
- 9.2.2.3 Largest Dollar Value for Each Line Item. Identify Subcontractors and materials suppliers proposed to provide portions of Work equal to or greater than ten thousand dollars (\$10,000) or one-half of one percent (0.5%) of their Contract Price, whichever is less.

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9.2.2.4 *Allowances.* Any Allowances provided for in the Contract shall be a line item in the Schedule of Values.

9.2.2.5 *Labor and Materials Shall Be Separate.* Labor and Materials shall be broken into two separate line items unless specifically agreed in writing by the District.

9.2.3 District Approval Required

The District shall review all submissions received pursuant to Article 9.2 in a timely manner. All submissions must be approved by the District before becoming the basis of any payment.

9.3 PROGRESS PAYMENTS

9.3.1 Payments to Contractor

Unless there is a resolution indicating that the Work for the Project is substantially complex, within thirty-five (35) days after approval of the Request for Payment, Contractor shall be paid a sum equal to ninety-five percent (95%) of the value of the Work performed (as certified by Architect and Inspector and verified by Contractor) up to the last day of the previous month, less the aggregate of previous payments. In the case of a Project designated substantially complex, the sum paid to the Contractor shall be equal to ninety percent (90%) of the value of the Work performed (as certified by the Architect and Inspector and verified by Contractor). The value of the Work completed shall be the Contractor's best estimate. Work completed as estimated shall be an approximation or estimate only and no mistake, inaccuracy, error or falsification in said any approved estimate shall operate to release the Contractor, or any Surety upon any bond, from damages arising from such Work, or from the District's enforcement of each and every provision of this Contract including but not limited to the Performance Bond and Payment Bond. The District shall have the right to subsequently to correct any mistake, inaccuracy, error or falsification made or otherwise set forth in any approved Request for Payment and such correction may occur in any future Payment Application or in the Retention Payment to the Contractor. No Surety upon any bond shall be relieved, released or exonerated of its obligations under this Contract or any applicable bond when the District is unable to correct an overpayment to the Contractor due to any abandonment by the Contractor or termination by the District.

The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for Work performed, so long as any lawful or proper direction given by the District concerning the Work, or any portion thereof, remains incomplete.

Notwithstanding anything to the contrary stated above, the Contractor may include in its Request for Payment the value of any structural steel, glue laminated beams, trusses, bleachers and other such custom-made materials prepared specifically for the Project and unique to the Project so long as all of the following requirements are satisfied:

- a. The aggregate cost of materials stored off-site shall not exceed Twenty Five Thousand Dollars (\$25,000) at any time or as otherwise agreed to be District in writing;

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- b. Title to such materials shall be vested in the District as evidenced by documentation satisfactory in form and substance to the District, including, without limitation, recorded financing statements, UCC filings and UCC searches;
- c. With each Contractor Request for Payment, the Contractor shall submit to the District a written list identifying each location where materials are stored off-site (which must be a bonded warehouse) and the value of the materials at each location. The Contractor shall procure insurance satisfactory to the District (in its reasonable discretion) for materials stored off-site in an amount not less than the total value thereof;
- d. The consent of any Surety shall be obtained to the extent required prior to payment for any materials stored off-site;
- e. Representatives of the District shall have the right to make inspections of the storage areas at any time; and
- f. Such materials shall be: (1) protected from diversion, destruction, theft and damage to the reasonable satisfaction of the District; (2) specifically marked for use on the Project; and (3) segregated from other materials at the storage facility.

9.3.2 Purchase of Materials and Equipment and Cost Fluctuations

The Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from District to assure that there will be no delays. Contractor understands that materials fluctuate in value and shall have adequately addressed market fluctuations through agreements with Contractor vendors or by other means. Contractor further understands and incorporates into Contractor's bid cost any wage rate increases during the Project for the Contractor's labor force as well as all other Subcontractor and vendor labor forces. District shall not be responsible for market fluctuations in costs or labor rate increases during the Project. Contractor further has incorporated any and all cost increases in areas of Work where there may be schedule variations so that cost increases are not passed through to the District.

9.3.3 No Waiver

No payment by District hereunder shall be interpreted so as to imply that District has inspected, approved, or accepted any part of the Work. Contractor specifically understands that Title 24 Section 4-343 which states:

"It is the duty of the contractor to complete the work covered by his or her contract in accordance with the approved Plans and Specifications therefore. The contractor in no way is relieved of any responsibility by the activities of the Architect, Engineer, Inspector or DSA in the performance of such duties... In no case, however, shall the instruction of the Architect or registered Engineer be construed to cause work to be done with is not in conformity with the approved Plans, Specifications, and change orders..."

Notwithstanding any payment, the District may enforce each and every provision of this Contract which includes, but is not limited to, the Performance Bond and Payment Bond.

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The District may correct any error subsequent to any payment. In no event shall the Contractor or the Surety be released or exonerated from performance under this Contract when the District overpays the Contractor based upon any mistake, inaccuracy, error or falsification in any estimate that is included in any Request for Payment.

9.3.4 Issuance of Certificate of Payment

The Architect shall, within seven (7) days after receipt of the Contractor's Application for Payment, either approve such payment or notify the Contractor in writing of the Architect's reasons for withholding approval in whole or in part as provided in Article 9.6. The review of the Contractor's Application for Payment by the Architect is based on the Architect's observations at the Project and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. In some cases, the Architect may act upon or rely on the evaluation of the Work by the Inspector. This review of Payment Applications is sometimes called a "Pencil Draft." District's return of a Pencil Draft shall constitute the District's dispute of the Payment Application that has been submitted. Contractor shall promptly respond to Pencil Drafts or Contractor's Payment Applications may be delayed. Contractor's failure to promptly respond to a Pencil Draft shall qualify as a delay in the prompt payment of a Request for Payment or Request for Retention. The foregoing representations are subject to: (1) an evaluation of the Work for conformance with the Contract Documents, (2) results of subsequent tests and inspections, (3) minor deviations from the Contract Documents correctable prior to completion, and (4) specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute the Contractor's verified representation that the Contractor is entitled to payment in the amount certified.

9.3.5 Payment of Undisputed Contract Payments

In accordance with Public Contract Code section 7100, payments by the District to the Contractor for any and all undisputed amounts (including all Progress Payments, Final Payments or Retention Payment) is contingent upon submission of a proper and accurate Payment Application and the Contractor furnishing the District with a release of all Claims against the District related to such undisputed amounts. Disputed Contract Claims in stated amounts may be specifically excluded by the Contractor from the operation of the release. If, however, the Contractor specifically excludes any Claims, the Contractor shall provide details such as a specific number of disputed days or costs of any such exclusion in accordance with Articles 4.6 and 7.7.

9.4 APPLICATIONS FOR PROGRESS PAYMENTS

9.4.1 Procedure

9.4.1.1 *Application for Progress.* On or before the fifth (5th) day of each calendar month during the progress of the Work, Contractor shall submit to the Architect an itemized Application for Progress Payment for operations completed. Such application shall be notarized, if required, and supported by the following or such portion thereof as Architect requires:

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1. The amount paid to the date of the Payment Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;
 2. The amount being requested under the Payment Application by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;
 3. The balance that will be due to each of such entities after said payment is made;
 4. A certification that the As-Built Drawings and Annotated Specifications are current;
 5. Itemized breakdown of Work done for the purpose of requesting partial payment;
 6. An updated or approved Baseline Schedule or other Schedule updates in conformance with Article 8;
 7. Failure to submit an updated Schedule for the month or any previous month;
 8. The additions to and subtractions from the Contract Price and Contract Time;
 9. A summary of the Retention held;
 10. Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the District may require from time to time;
 11. The percentage of completion of the Contractor's Work by line item;
 12. An updated Schedule of Values from the preceding Application for Payment;
 13. Prerequisites for Progress Payments; and
 14. Any other information or documents reasonably requested by the District, Architect, Inspector or CM (if applicable).
- 9.4.1.2 *First Payment Request.* The following items, if applicable, must be completed before the first payment request will be accepted for processing:
1. Installation of the Project sign;
 2. Receipt by Architect of Submittals;
 3. Installation of field office;

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4. Installation of temporary facilities and fencing;
5. Submission of documents listed in the Article 9.2 relating to Contract Price breakdown;
6. Preliminary schedule analysis, due within 10 days after Notice to Proceed;
7. Contractor's Baseline Schedule (to be CPM based in conformance with Article 8);
8. Schedule of unit prices, if applicable;
9. Submittal Schedule;
10. Copies of necessary permits;
11. Copies of authorizations and licenses from governing authorities;
12. Initial progress report;
13. Surveyor qualifications;
14. Written acceptance of District's survey of rough grading, if applicable;
15. List of all Subcontractors, with names, license numbers, telephone numbers, and scope of work;
16. All bonds and insurance endorsements; and
17. Resumes of General Contractor's Project Manager, and if applicable, job site secretary, record documents recorder, and job site Superintendent.

9.4.1.3 *Second Payment Request.* The second payment request will not be processed until all Submittals and Shop Drawings have been accepted for review by the Architect.

9.4.1.4 *All Payment Requests.* No payment requests will be processed unless Contractor has submitted copies of the certified payroll records for the Work which correlates to the payment request and a proper CPM schedule pursuant to Article 8 is submitted.

9.4.1.5 *Final Payment Application (95%).* See Article 9.11.1

9.4.1.6 *Final Payment Application (100%).* See Article 9.11.3

9.5 STOP NOTICE CLAIMS AND WARRANTY OF TITLE

The Contractor warrants title to all Work. The Contractor further warrants that all Work is free and clear of liens, claims, security interests, stop notices, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work. Failure to keep

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work free of liens, stop notices, claims, security interests or encumbrances is grounds to make a claim against Contractor's Payment and Performance Bond to immediately remedy and defend.

If a lien or stop notice of any nature should at any time be filed against the Work or any District property, by any entity which has supplied material or services at the request of the Contractor, Contractor and Contractor's Surety shall promptly, on demand by District and at Contractor's and Surety's own expense, take any and all action necessary to cause any such lien or stop notice to be released or discharged immediately therefrom.

If the Contractor fails to furnish to the District within ten (10) calendar days after written demand by the District, satisfactory evidence that a lien or stop notice has been so released, discharged, or secured, then District may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney's fees and expense incurred or suffered by District from any sum payable to Contractor under the Contract. In addition, any liens, stop notices, claims, security interests or encumbrances shall trigger the indemnification requirements under Article 3.15 and the Agreement Form, and shall act as a trigger under Civil Code section 2778 and 2779 requiring reimbursement for any and all costs following the District's written demand has been made. Any withholdings by the District for stop notices in accordance with Civil Code section 9358 shall not be a basis by the Contractor to make a Claim for interest penalties under Public Contract Code sections 7107 or 20104.50.

9.6 DECISIONS TO WITHHOLD PAYMENT

9.6.1 Reasons to Withhold Payment

The District may withhold payment in whole, or in part, to the extent reasonably necessary to protect the District if, in the District's opinion, the representations to the District required by Article 9.4 cannot be made. The District may withhold payment, in whole, or in part, to such extent as may be necessary to protect the District from loss because of, but not limited to:

- a. Defective Work not remedied;
- b. Stop notices served upon the District;
- c. Liquidated Damages assessed against the Contractor;
- d. The cost of Completion of the Contract if there exists reasonable doubt that the Work can be Completed for the unpaid balance of any Contract Price or by the completion date;
- e. Damage to the District or other contractor;
- f. Unsatisfactory prosecution of the Work by the Contractor;
- g. Failure to store and properly secure materials;
- h. Failure of the Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, acceptable monthly progress schedules, Shop Drawings, Submittal schedules,

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Schedule of Values, Product Data and samples, proposed product lists, executed Change Order, Construction Change Documents, and verified reports;

- i. Failure of the Contractor to maintain As-Built Drawings;
- j. Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Payment Application;
- k. Unauthorized deviations from the Contract Documents (including but not limited to Unresolved Notices of Deviations (DSA Form 154));
- l. Failure of the Contractor to prosecute the Work in a timely manner in compliance with established progress schedules and completion dates.
- m. Failure to properly pay prevailing wages as defined in Labor Code section 1720, et seq.;
- n. Failure to properly maintain or clean up the Site;
- o. Payments to indemnify, defend, or hold harmless the District;
- p. Any payments due to the District including but not limited to payments for failed tests, or utilities changes or permits;
- q. Failure to submit an acceptable Baseline Schedule or any Schedule or Schedule update in accordance with Article 8;
- r. Failure to pay Subcontractor or suppliers as required by Article 9.8.1
- s. Failure to secure warranties, including the cost to pay for warranties;
- t. Failure to provide releases from material suppliers or Subcontractors when requested to do so;
- u. Items deducted pursuant to Article 2.2;
- v. Incomplete Punch List items under Article 9.9.1.1 which have gone through the Article 2.2 process; or
- w. Allowances that have not been used.

9.6.2 Reallocation of Withheld Amounts

District may, in its discretion, apply any withheld amount to payment of outstanding claims or obligations as defined in Article 9.6.1 and 9.5. In so doing, District shall make such payments on behalf of Contractor. If any payment is so made by District, then such amount shall be considered as a payment made under Contract by District to Contractor and District shall not be liable to Contractor for such payments made in good faith. Such payments may be made without prior judicial determination of claim or obligation. District will render Contractor an accounting of such funds disbursed on behalf of Contractor.

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If Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents or fails to perform any provision thereof, District may, after ten (10) calendar days written notice to the Contractor and without prejudice to any other remedy make good such deficiencies. The District shall adjust the total Contract price by reducing the amount thereof by the cost of making good such deficiencies. If District deems it inexpedient to correct Work which is damaged, defective, or not done in accordance with Contract provisions, an equitable reduction in the Contract Price (of at least 150% of the estimated reasonable value of the nonconforming Work) shall be made therefor.

9.6.3 Payment After Cure

When the grounds for declining approval are removed, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

9.7 NONCONFORMING WORK

Contractor shall promptly remove from premises all Work identified by District as failing to conform to the Contract whether incorporated or not. Contractor shall promptly replace and re-execute its own Work to comply with the Contract without additional expense to District and shall bear the expense of making good all Work of other contractors destroyed or damaged by such removal or replacement.

If Contractor does not remove such Work which has been identified by District as failing to conform to the Contract Documents within a reasonable time, fixed by written notice, District may remove it and may store the material at Contractor's expense. If Contractor does not pay expenses of such removal within ten (10) calendar days' time thereafter, District may, upon ten (10) calendar days' written notice, sell such materials at auction or at private sale and shall account for net proceeds thereof, after deducting all costs and expenses that should have been borne by Contractor.

9.8 SUBCONTRACTOR PAYMENTS

9.8.1 Payments to Subcontractors

No later than ten (10) days after receipt, or pursuant to Business and Professions Code section 7108.5, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.8.2 No Obligation of District for Subcontractor Payment

The District shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

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9.8.3 Payment Not Constituting Approval or Acceptance

An approved Request for Payment, a progress payment, a Certificate of Substantial Completion, or partial or entire use or occupancy of the Project by the District shall not constitute acceptance of Work that is not in accordance with the Contract Documents.

9.8.4 Joint Checks

District shall have the right, if necessary for the protection of the District, to issue joint checks made payable to the Contractor and Subcontractors and material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the District and a Subcontractor of any tier, any obligation from the District to such Subcontractor, or rights in such Subcontractor against the District. The District may choose to issue joint checks at District's sole discretion and only after all the requirements of that particular school district and county are specifically met. Some school districts cannot issue joint checks, so the ability to issue joint checks depends on the school district and the specific circumstances.

9.9 COMPLETION OF THE WORK

9.9.1 Close-Out Procedures

9.9.1.1 *Incomplete Punch Items.* When the Contractor considers the Work Substantially Complete (See Article 1.1.46 for definition of Substantially Complete), the Contractor shall prepare and submit to the District a comprehensive list of minor items to be completed or corrected (hereinafter "Incomplete Punch Items" or "Punch List"). The Contractor and/or its Subcontractors shall proceed promptly to complete and correct the Incomplete Punch Items listed. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Contractor is aware that Title 24 Section 4-343(a) provides:

"RESPONSIBILITIES. IT IS THE DUTY OF THE CONTRACTOR TO COMPLETE THE WORK COVERED BY HIS OR HER CONTRACT IN ACCORDANCE WITH THE APPROVED PLANS AND SPECIFICATIONS THEREFOR. THE CONTRACTOR IN NO WAY IS RELIEVED OF ANY RESPONSIBILITY BY THE ACTIVITIES OF THE ARCHITECT, ENGINEER, INSPECTOR OR DSA IN THE PERFORMANCE OF SUCH DUTIES.

9.9.1.2 *Punch List Is Prepared Only After the Project Is Substantially Complete.* If any of the conditions noted in Article 1.1.46 as defining Substantial Completion are not met, the Inspector, Architect or District may reject Contractor's Incomplete Punch Items as premature. If the Architect and Inspector commence review of Incomplete Punch Items, all rights are reserved until the Project actually meets the definition of Substantially Complete. Liquidated Damages, warranties, and other contractual rights are not affected by Incomplete Punch Items unless otherwise addressed in these General Conditions.

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Once the Inspector and the Architect determine the Project is Substantially Complete, a Certificate of Substantial Completion shall be issued. The Inspector and Architect shall prepare a Punch List of items which is an inspection report of the Work, if any, required in order to complete the Contract Documents and ensure compliance with the DSA Approved Plans so the Project may be Completed by the Contractor and a final DSA Close-Out is approved. When all Work for the Project is Complete, including Punch Lists and all Work complies with the approved Contract Documents and Change Orders, the Project has reached Final Completion.

- 9.9.1.3 *Time for Completion of Punch List.* Contractor shall only be given a period of no more than thirty (30) days to complete the Punch List for the Project. During the Punch List period, the Contractor's Superintendent and Project Manager shall remain engaged in the Project and shall not be removed or replaced. If the Punch List is not completed at the end of the Punch List time then Contractor shall issue a valued Punch List within 5 days after the date the Punch List time ends. If Contractor does not issue such a list, the District or Architect may issue a valued Punch List to the Contractor and withhold up to 150% of the value of the Punch List Work pursuant to Article 2.2 of this Agreement.

Failure to issue a timely written request for additional time to complete Punch List shall result in the deletion of the remaining Punch List Work pursuant to Article 2.2 and the issuance of a Deductive Change Order.

- a. Extension of Time to Complete Punch List. If Contractor cannot finish the Punch List Work during the time period allotted under Article 9.9.1.3, the Contractor may make a written request for a Non-Compensable Punch List time extension accompanied by an estimate of the number of additional days it will take to complete the Punch List Work for a written consent from the District to allow continued Punch List Work. Punch List time extensions are a maximum of thirty (30) days for each request and must be accompanied by an itemized valued Punch List.
- b. If there is no valued Punch List accompanying any request or if Contractor intends to undertake Punch List without the continued support and supervision of its Superintendent and Project Manager (as required under Article 3.2), the District, Construction Manager or Architect may issue a valued Punch List, reject the Punch List Time Extension and deduct 150% of the valued Punch List pursuant to Article 2.2 and proceed to Close-Out the Project. Contractor shall cease work on the Project and proceed to complete Contractor's Retention Payment Application and complete the Work for the Project required pursuant to Article 9.11.3.

- 9.9.1.4 *District Rejection of Written Request for Punch List Time Extensions.* Following sixty (60) Days of Punch List under Article 9.9.1.3, the District has the option of rejecting Punch List Time Extension requests. The District may proceed under Article 2.2 and deduct the value of remaining Punch List Work pursuant to Article 2.2. If the District rejects the Punch List Time Extension request then Contractor shall cease Work on the Project and proceed to Final Inspection pursuant to Article 9.11.2.

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- 9.9.1.5 *Punch List Liquidated Damages to Compensate for Added District Project Costs.* If the total time utilized for Punch List exceeds sixty (60) days [the thirty (30) day period under Article 9.9.1.3 plus an additional thirty (30) day period that has been requested in writing], and the District grants an additional written Punch List Time Extension that exceeds sixty (60) days of Punch List, then Contractor shall be charged Liquidated Damages of at least \$750 per day for continued Punch List Work to partially compensate the Inspector, Architect, and Construction Manager's extended time on the Project. This Punch List Liquidated Damage number is based on anticipated cost for an Inspector on site and additional costs for the Architect and Construction Manager to reinspect Punch List items and perform the administration of the Close-out.

Contractor received thirty (30) days without any charges for Punch List Liquidated Damages and is placed on notice pursuant to this Article 9.9.1.5 that \$750 is due for each day of Punch List that exceeds sixty (60) days at \$750, a cost much lower than typical (and actual) costs for Inspection, Architect and Construction Manager time required during Punch List. Starting at ninety (90) days of Punch List (an excessive number of days to complete Punch List), the District shall be entitled to adjust Punch List Liquidated Damages to an estimate of the actual costs incurred to oversee, monitor and inspect the Punch List. If costs exceed \$750 per day, the anticipated extended contract charges for Inspection, Architect, Construction Manager, and any other costs that will be incurred due to the extended Punch List shall be itemized and a daily rate of Punch List Liquidated Damages shall be presented in writing to the Contractor within five (5) days following the receipt of a written request for Punch List Time Extension by the Contractor that extends the Punch List time beyond ninety (90) days. This written notice of actual Punch List Liquidated Damages may be provided to the Contractor at any time following the first written request for Punch List Time extension requested under Article 9.9.1.3. The adjusted actual Punch List Liquidated Damage amount shall be applicable as Punch List Liquidated Damages commencing on the ninetieth (90th) day of Punch List.

9.9.2 Close-Out Requirements for Final Completion of the Project

- a. Utility Connections. Buildings shall be connected to water, gas, sewer, and electric services, complete and ready for use. Service connections shall be made and existing services reconnected
- b. As-Builts Up to Date and Complete. The intent of this procedure is to obtain an exact "As-Built" record of the Work upon completion of the project. The following information shall be carefully and correctly drawn on the prints and all items shall be accurately located and dimensioned from finished surfaces of building walls on all As-Built Drawings
 1. The exact location and elevations of all covered utilities, including valves, cleanouts, etc. must be shown on As-Built Drawings
 2. Contractor is liable and responsible for inaccuracies in As-Built Drawings, even though they become evident at some future date.
 3. Upon completion of the Work and as a condition precedent to approval of Retention Payment, Contractor shall obtain the Inspector's approval of the "As-Built" information. When completed, Contractor shall deliver corrected sepias and/or a Diskette with an electronic file in a format acceptable to the District.

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4. District may withhold the cost to hire a draftsman and potholing and testing service to complete Record As-Built Drawings at substantial cost if the Contractor does not deliver a complete set of Record As-Built Drawings. This shall result in withholding of between \$10,000 to \$20,000 per building that does not have a corresponding Record As Built Drawing.
- c. Any Work not installed as originally indicated on Drawings
- d. All DSA Close-Out requirements (See DSA Certification Guide) Contractor is also specifically directed to Item 3.2 in the DSA Certification Guide and the applicable certificates for the DSA-311 form.
- e. Submission of Form 6-C. Contractor shall be required to execute a Form 6-C as required under Title 24 Sections 4-343. The Contractor understands that the filing with DSA of a Form 6-C is a requirement to obtain final DSA Approval of the construction by Contractor and utilized to verify under penalty of perjury that the Work performed by Contractor complies with the DSA approved Contract Documents. The failure to file a DSA Form 6C has two consequences. First, the Construction of the Project will not comply with the design immunity provisions of Government Code section 830.6 and exposes the District and the individual Board members to personal liability for injuries that occur on the Project.

Secondly , under DSA IR A-20, since the Project cannot be Certified by DSA, no future or further Projects will be authorized so Contractor will have essentially condemned the campus from any future modernization or addition of new classrooms through their failure to file the DSA Form 6C.

1. *Execution of the DSA Form 6-C is Mandatory.* Refusal to execute the Form 6-C, which is a Final DSA Verified Report that all Work performed complies with the DSA approved Contract Documents is a violation of Education Code section 17312 and shall be referred to the Attorney General for Prosecution.
2. *Referral to the District Attorney for Extortion.* If the Contractor's refusal to execute the DSA Form 6C is to leverage a Dispute, Claim or litigation, then the matter shall also be referred to the District Attorney for prosecution for extortion.
3. *Contractor shall be Responsible for All Costs to Certify the Project.* The District may certify the Project complies with Approved Plans and Specifications by utilizing the procedures under the Project Certification Guide (located at the DSA website). All costs for professionals, inspection, and testing required for an alternate Project Certification shall be the Contractor's responsibility and the District reserves its right to institute legal action against the Contractor and Contractor's Surety for all costs to certify the Project and all costs to correct Non-Compliant Work that is discovered during the Alternate Certification Process.

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- f. ADA Work that must be corrected to receive DSA certification. See Article 12.2.
- g. Maintenance Manuals. At least thirty (30) days prior to final inspection, three (3) copies of complete operations and maintenance manuals, repair parts lists, service instructions for all electrical and mechanical equipment, and equipment warranties shall be submitted. All installation, operating, and maintenance information and Drawings shall be bound in 8½" x 11" binders. Provide a table of contents in front and all items shall be indexed with tabs. Each manual shall also contain a list of Subcontractors, with their addresses and the names of persons to contact in cases of emergency. Identifying labels shall provide names of manufactures, their addresses, ratings, and capacities of equipment and machinery.
 - 1. Maintenance manuals shall also be delivered in electronic media for the Project. Any demonstration videos shall also be provided on electronic media.
- h. Inspection Requirements. Before calling for final inspection, Contractor shall determine that the following Work has been performed:
 - 1. The Work has been completed;
 - 2. All fire/ life safety items are completed and in working order;
 - 3. Mechanical and electrical Work complete, fixtures in place, connected and tested;
 - 4. Electrical circuits scheduled in panels and disconnect switches labeled;
 - 5. Painting and special finishes complete;
 - 6. Doors complete with hardware, cleaned of protective film relieved of sticking or binding and in working order;
 - 7. Tops and bottoms of doors sealed;
 - 8. Floors waxed and polished as specified;
 - 9. Broken glass replaced and glass cleaned;
 - 10. Grounds cleared of Contractor's equipment, raked clean of debris, and trash removed from Site;
 - 11. Work cleaned, free of stains, scratches, and other foreign matter, replacement of damaged and broken material;
 - 12. Finished and decorative work shall have marks, dirt and superfluous labels removed;
 - 13. Final cleanup, as in Article 3.12;
 - 14. All Work pursuant to Article 9.11.2; and

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15. Furnish a letter to District stating that the District's Representative or other designated person or persons have been instructed in working characteristics of mechanical and electrical equipment.

9.9.3 Costs of Multiple Inspections

More than two (2) requests of the District to make inspections required under Article 9.9.1 shall be considered an additional service of Architect, Inspector, Engineer or other consultants shall be the Contractor's responsibility pursuant to Article 4.5 and all subsequent costs will be prepared as a Deductive Change Order.

9.10 PARTIAL OCCUPANCY OR USE

9.10.1 District's Rights

The District may occupy or use any completed or partially completed portion of the Work at any stage. The District and the Contractor shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents. If District and Contractor cannot agree as to responsibilities such disagreement shall be resolved pursuant to Article 4.6. When the Contractor considers a portion complete, the Contractor shall prepare and submit a Punch List to the District as provided under Article 9.9.1.

9.10.2 Inspection Prior to Occupancy or Use

Immediately prior to such partial occupancy or use, the District, the Contractor, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.10.3 No Waiver

Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.11 COMPLETION AND FINAL PAYMENT

9.11.1 Final Payment (90% Billing if Substantially Complex Finding and 95% Billing If No Finding Is Made)

The following items must be completed before the Final Payment Application will be accepted for processing at Substantial Completion of the Project:

- a. Inspector sign-off of each item in the DSA 152 Project Inspection Card;
- b. The Project has reached the Punch List items under Article 9.9.1.2 and the Project has been determined to be Substantially Complete under Article 1.1.46;
- c. Removal of temporary facilities and services;

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- d. Testing, adjusting and balance records are complete;
- e. Removal of surplus materials, rubbish, and similar elements;
- f. Changeover of door locks;
- g. Deductive items pursuant to Article 9.6 and Article 2.2; and
- h. Completion and submission of all final Change Orders for the Project.

9.11.2 Final Inspection (Punch List Completion)

Contractor shall comply with Punch List procedures under Article 9.9.1.1, and maintain the presence of Project Superintendent and Project Manager (not replacement project superintendent or project manager) until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Contractor demobilize its forces prior to completion of the Punch List.

Upon completion of the Work under Article 9.9.1, the Contractor shall notify the District and Architect, who shall again inspect such Work. If the Architect and the District find the Work contained in the Punch List acceptable under the Contract Documents, the Work shall have reached Final Completion. Architect shall notify Contractor, who shall then submit to the Architect its Application for Retention Payment. This Application for Retention Payment shall contain any deductions under Article 9.6, including but not limited to incomplete Punch List items under Article 9.9.1.

Upon receipt and approval of Application for Retention Payment, the Architect shall issue a Form 6 stating that to the best of its knowledge, information, and belief, and on the basis of its observations, inspections, and all other data accumulated or received by the Architect in connection with the Work, such Work has been completed in accordance with the Contract Documents. The District shall thereupon inspect such Work and either accept the Work as complete or notify the Architect and the Contractor in writing of reasons why the Work is not complete. Upon acceptance of the Work of the Contractor as fully complete (which, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the District shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of payment from the District, pay the amounts due Subcontractors.

If the Architect and the District find that the Work contained in the Punch List is unacceptable, then Contractor shall issue a valued Punch List within 5 days after the date the Punch List time ends. If Contractor does not issue such a list, the District or Architect may issue a valued Punch List to the Contractor and withhold up to 150% of the value of the Punch List Work pursuant to Article 2.2 of this Agreement.

9.11.3 Retainage (100% Billing for the Entire Project)

The retainage, less any amounts disputed by the District or which the District has the right to withhold pursuant to the Contract Documents (including but not limited to incomplete Punch List items under Article 9.9.1), shall be paid after approval by the District of the Application for Retention Payment, after the satisfaction of the conditions set forth in

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Article 9, the Final Inspection under Article 9.11.2 is completed, and after thirty-five (35) days after the acceptance of the Work and recording of the Notice of Completion by District. No interest shall be paid on any retainage, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any escrow agreement between the District and the Contractor.

- a. Procedures for Application for Retention Payment. The following conditions must be fulfilled prior to release of Retention Payment:
1. A full and final waiver or release of all stop notices in connection with the Work shall be submitted by Contractor, including a release of stop notice in recordable form, together with (to the extent permitted by law) a copy of the full and final release of all Stop Notice rights.
 2. The Contractor shall have made all corrections, including all Punch List Items, to the Work which are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of District required under the Contract Documents.
 3. Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, releases from the Surety and warranty bonds (if applicable) required by the Contract Documents for its portion of the Work.
 4. Contractor must have completed all requirements set forth in Article 9.9
 5. Contractor must have issued a Form 6C for the Project.
 6. The Contractor shall have delivered to the District all manuals and materials required by the Contract Documents.
 7. The Contractor shall have completed final clean up as required by Article 3.12
 8. Contractor shall have all deductive items under Article 9.6 and Article 2.2 submitted as part of the Retention Payment.

9.11.4 Recording of a Notice of Completion After Punch List Period and Final Inspection.

When the Work, or designated portion thereof, is complete or the District has completed the Article 9.6 and/or the Article 2.2 process, whichever occurs first, the District will file either a Notice of Completion or a Notice of Completion noting valued Punch List items. Valued Punch List items will be deducted from the Retention Payment.

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During the time when Work is being performed on the Punch List, the Project does not meet the definition of “Complete” under Public Contract Code section 7107(c)(1) even if there is “beneficial occupancy” of the Project since that has been no “cessation of labor” on the Project. Completion of Punch List under this Article is not “testing, startup, or commissioning by the public entity or its agent.” In other words, the continuing Punch List Work is Contractor labor on the Project until each and every item of Punch List Work is complete or the time periods under Article 9.9.1 have expired.

9.11.5 Warranties

Warranties required by the Contract Documents shall commence on the date of Completion of the entire Work. Warranty periods DO NOT commence at Substantial Completion or when a particular Subcontractor work is complete. No additional charges, extras, Change Orders, or Claims may be sought for warranties commencing from the Notice of Completion.

District shall have the right to utilize equipment, test, and operate as necessary for acclimation, or testing without voiding or starting warranties. Taking beneficial occupancy shall not start warranties except in the case where the District agrees, in writing, that warranties shall commence running or where the District is taking phased occupancy of specific buildings or areas and completes separate Punch Lists as further addressed in Article 4.2.7.

9.11.6 Time for Submission of Application for Final Payment and Retention Payment (Unilateral Processing of Final and Retention Payment Application).

If Contractor submits a Final Payment Application which fails to include deductive items under Article 9.6, the District or Architect shall note this defective request for Final Payment Application. The Contractor shall be notified that specific deductive items shall be included in the Final Payment Application. If Contractor either continues to submit the Final Payment Application without deductive items under Article 9.6, or a period of 14 calendar days passes after Contractor is provided written notice of deductive items for inclusion in Final Payment Application, then District may either alter the Final Payment Application and recalculate the math on the Final Payment Application to address the Article 9.6 deductive items or process a unilateral Final Payment Application.

9.11.7 Unilateral Release of Retention

After the recordation of the Notice of Completion, or within sixty (60) days following the completion of the Punch List or the expiration of the time for completion of Punch List under Article 9.9.1, if Contractor does not make an Application for Release of Retention, the District may unilaterally release retention less any deducts under Article 9.6 and/or Article 2.2, withholds due to stop notices, or withholdings due to other defective Work on the Project. District may also choose to unilaterally release Retention after deduction of 150% of any disputed items, which may also include items under Article 9.6 and 2.2. If a deduction pursuant to Article 9.6 is made from Retention, a letter deducting specific valued items shall be considered a notice of Default under the terms of the Escrow Agreement.

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9.12 SUBSTITUTION OF SECURITIES

The District will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300 as set forth in the form contained in the Bid Documents.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 Contractor Responsibility

The Contractor shall be responsible for all damages to persons or property that occur as a result of its fault or negligence in connection with the prosecution of this Contract and shall take all necessary measures and be responsible for the proper care and protection of all materials delivered and Work performed until completion and final acceptance by the District. All Work shall be solely at the Contractor's risk, with the exception of damage to the Work caused by "acts of God" as defined in Public Contract Code section 7105(b)(2).

Contractor shall take, and require Subcontractor to take, all necessary precautions for safety of workers on the Work and shall comply with all applicable federal, state, local and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to premises where Work is being performed and to provide a safe and healthful place of employment. In addition to meeting all requirements of OSHA, Cal-OSHA, state, and local codes, Contractor shall furnish, erect and properly maintain at all times, as directed by District or Architect or required by conditions and progress of Work, all necessary safety devices, safeguards, construction canopies, signs, audible devices for protection of the blind, safety rails, belts and nets, barriers, lights, and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created by such features in the course of construction. Contractor shall designate a responsible member of its organization on the Work, whose duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety requirements, and to protect the life, safety and health of workers. The name and position of person so designated shall be reported to District by Contractor. Contractor shall correct any violations of safety laws, rules, orders, standards, or regulations. Upon the issuance of a citation or notice of violation by the Division of Occupational Safety and Health, such violation shall be corrected promptly.

10.1.2 Subcontractor Responsibility

Contractor shall require that Subcontractors participate in, and enforce, the safety and loss prevention programs established by the Contractor for the Project, which will cover all Work performed by the Contractor and its Subcontractors. Each Subcontractor shall designate a responsible member of its organization whose duties shall include loss and accident prevention, and who shall have the responsibility and full authority to enforce the program. This person shall attend meetings with the representatives of the various

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Subcontractors employed to ensure that all employees understand and comply with the programs.

10.1.3 Cooperation

All Subcontractors and material or equipment suppliers shall cooperate fully with Contractor, the District, and all insurance carriers and loss prevention engineers.

10.1.4 Accident Reports

Subcontractors shall immediately, within two (2) days, report in writing to the Contractor all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on or off the Site, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported within four (4) days by telephone or messenger. Contractor shall thereafter immediately, within two (2) days, report the facts in writing to the District and the Architect giving full details of the accident.

10.1.5 First-Aid Supplies at Site

The Contractor will provide and maintain at the Site first-aid supplies which complies with the current Occupational Safety and Health Regulations.

10.1.6 Material Safety Data Sheets and Compliance with Proposition 65

Contractor is required to have material safety data sheets available in a readily accessible place at the job site for any material requiring a material safety data sheet per the Federal "hazard communication" standard, or employees' "right-to-know law." The Contractor is also required to properly label any substance brought into the job site, and require that any person working with the material, or within the general area of the material, is informed of the hazards of the substance and follows proper handling and protection procedures.

Contractor is required to comply with the provisions of California Health and Safety Code section 25249, et seq., which requires the posting and giving of notice to persons who may be exposed to any chemical known to the State of California to cause cancer. The Contractor agrees to familiarize itself with the provisions of this Section, and to comply fully with its requirements.

10.1.7 Non-Utilization of Asbestos Material

NO ASBESTOS OR ASBESTOS-CONTAINING PRODUCTS SHALL BE USED IN THIS CONSTRUCTION OR IN ANY TOOLS, DEVICES, CLOTHING, OR EQUIPMENT USED TO EFFECT THIS CONSTRUCTION.

Asbestos and/or asbestos-containing products shall be defined as all items containing, but not limited to, chrysotile, amosite, anthophyllite, tremolite, and antinolite.

Any or all material containing greater than one-tenth of one percent (>.1%) asbestos shall be defined as asbestos-containing material.

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All Work or materials found to contain asbestos or Work or material installed with asbestos-containing equipment will be immediately rejected and this Work will be removed at no additional cost to the District.

Decontamination and removal of Work found to contain asbestos or Work installed with asbestos-containing equipment shall be done only under supervision of a qualified consultant, knowledgeable in the field of asbestos abatement and accredited by the Environmental Protection Agency.

The asbestos removal contractor shall be an EPA accredited contractor qualified in the removal of asbestos and shall be chosen and approved by the asbestos consultant, who shall have sole discretion and final determination in this matter.

The asbestos consultant shall be chosen and approved by the District, who shall have sole discretion and final determination in this matter.

The Work will not be accepted until asbestos contamination is reduced to levels deemed acceptable by the asbestos consultant.

Interface of Work under this Contract with Work containing asbestos shall be executed by the Contractor at his risk and at his discretion, with full knowledge of the currently accepted standards, hazards, risks, and liabilities associated with asbestos work and asbestos-containing products. By execution of this Contract, the Contractor acknowledges the above and agrees to hold harmless District and its assigns for all asbestos liability which may be associated with this work and agrees to instruct his employees with respect to the above-mentioned standards, hazards, risks, and liabilities.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor

The Contractor shall take reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury, or loss to:

- a. Employees on the Work and other persons who may be affected thereby;
- b. The Work, material, and equipment to be incorporated therein, whether in storage on or off the Site, under the care, custody, or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- c. Other property at the Site or adjacent thereto such as trees, shrubs, lawns, walks, pavement, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

Contractor is constructive owner of Project site as more fully discussed in Article 6.2.

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10.2.2 Contractor Notices

The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on the safety of persons or property or their protection from damage, injury, or loss.

10.2.3 Safety Barriers and Safeguards

The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

10.2.4 Use or Storage of Hazardous Material

When use or storage of explosives, other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. The Contractor shall notify the District any time that explosives or hazardous materials are expected to be stored on Site. Location of storage shall be coordinated with the District and local fire authorities.

10.2.5 Protection of Work

The Contractor and Subcontractors shall continuously protect the Work, the District's property, and the property of others, from damage, injury, or loss arising in connection with operations under the Contract Documents. The Contractor and Subcontractors, at their own expense, shall make good any such damage, injury, or loss, except such as may be solely due to, or caused by, agents or employees of the District.

The Contractor, at Contractor's expense, will remove all mud, water, or other elements as may be required for the proper protection and prosecution of its Work.

Contractor shall take adequate precautions to protect existing roads, sidewalks, curbs, pavements, utilities, adjoining property and structures (including, without limitation, protection from settlement or loss of lateral support), and to avoid damage thereto, and repair any damage thereto caused by construction operations. All permits, licenses, or inspection fees required for such repair Work shall be obtained and paid for by Contractor.

10.2.6 Requirements for Existing Sites

Contractor shall (unless waived by the District in writing):

- a. When performing construction on existing sites, become informed and take into specific account the maturity of the students on the Site; and perform Work which may interfere with school routine before or after school hours, enclose working area with a substantial barricade, and arrange Work to cause a minimum amount of inconvenience and danger to students and faculty in their regular school activities. The Contractor shall comply with Specifications and directives of the

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District regarding the timing of certain construction activities in order to avoid unnecessary interference with school functioning.

- b. Avoid performing any Work that will disturb students during testing.
- c. Provide substantial barricades around any shrubs or trees indicated to be preserved.
- d. Deliver materials to building area over route designated by Architect.
- e. Take preventive measures to eliminate objectionable dust, noise, or other disturbances.
- f. Confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits or directions of Architect; and not interfere with the Work or unreasonably encumber premises or overload any structure with materials; and enforce all instructions of District and Architect regarding signs, advertising, fires, and smoking and require that all workers comply with all regulations while on the Project site.
- g. Take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed by accident, they shall be replaced by an approved land surveyor or civil engineer and all maps and records required therefrom shall be filed with county and local authorities, at no cost to the District. All filing and plan check fees shall be paid by Contractor.
- h. Provide District on request with Contractor's written safety program and safety plan for each site.

10.2.7 Shoring and Structural Loading

The Contractor shall not impose structural loading upon any part of the Work under construction or upon existing construction on or adjacent to the Site in excess of safe limits, or loading such as to result in damage to the structural, architectural, mechanical, electrical, or other components of the Work. The design of all temporary construction equipment and appliances used in construction of the Work and not a permanent part thereof, including, without limitation, hoisting equipment, cribbing, shoring, and temporary bracing of structural steel, is the sole responsibility of the Contractor. All such items shall conform with the requirements of governing codes and all laws, ordinances, rules, regulations, and orders of all authorities having jurisdiction. The Contractor shall take special precautions, such as shoring of masonry walls and temporary tie bracing of structural steel Work, to prevent possible wind damage during construction of the Work. The installation of such bracing or shoring shall not damage the Work in place or the Work installed by others. Any damage which does occur shall be promptly repaired by the Contractor at no cost to the District.

10.2.8 Conformance within Established Limits

The Contractor and Subcontractors shall confine their construction equipment, the storage of materials, and the operations of workers to the limits indicated by laws, ordinances,

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permits, and the limits established by the District or the Contractor, and shall not unreasonably encumber the premises with construction equipment or materials.

10.2.9 Subcontractor Enforcement of Rules

Subcontractors shall enforce the District's and the Contractor's instructions, laws, and regulations regarding signs, advertisements, fires, smoking, the presence of liquor, and the presence of firearms by any person at the Site.

10.2.10 Site Access

The Contractor and the Subcontractors shall use only those ingress and egress routes designated by the District, observe the boundaries of the Site designated by the District, park only in those areas designated by the District, which areas may be on or off the Site, and comply with any parking control program established by the District, such as furnishing license plate information and placing identifying stickers on vehicles.

10.2.11 Security Services.

The Contractor shall be responsible for providing security services for the Site as needed for the protection of the Site and as determined in the District's sole discretion.

10.3 EMERGENCIES

10.3.1 Emergency Action

In an emergency affecting the safety of persons or property, the Contractor shall take any action necessary, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 7.

10.3.2 Accident Reports

The Contractor shall promptly report in writing to the District all accidents arising out of or in connection with the Work, which caused death, personal injury, or property damage, giving full details and statements of any witnesses in conformance with Article 10.1.4. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported in accordance with Article 10.1.4, immediately by telephone or messenger to the District.

10.4 HAZARDOUS MATERIALS

10.4.1 Discovery of Hazardous Materials

In the event the Contractor encounters or suspects the presence on the job site of material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or any other material defined as being hazardous by § 25249.5 of the California Health and Safety Code, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the District and the Architect in writing, whether or not such material was generated by the Contractor or the District. The Work in the affected

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area shall not thereafter be resumed, except by written agreement of the District and the Contractor, if in fact the material is asbestos, polychlorinated biphenyl (PCB), or other hazardous material, and has not been rendered harmless. The Work in the affected area shall be resumed only in the absence of asbestos, polychlorinated biphenyl (PCB), or other hazardous material, or when it has been rendered harmless by written agreement of the District and the Contractor.

10.4.2 Hazardous Material Work Limitations

In the event that the presence of hazardous materials is suspected or discovered on the Site (except in cases where asbestos and other hazardous material Work in the Contractor's responsibility), the District shall retain an independent testing laboratory to determine the nature of the material encountered and whether corrective measures or remedial action is required. The Contractor shall not be required pursuant to Article 7 to perform without consent any Work in the affected area of the Site relating to asbestos, polychlorinated biphenyl (PCB), or other hazardous material, until any known or suspected hazardous material has been removed, or rendered harmless, or determined to be harmless by District, as certified by an independent testing laboratory and approved by the appropriate government agency.

10.4.3 Indemnification by Contractor for Hazardous Material Caused by Contractor

In the event the hazardous materials on the Project Site is caused by the Contractor, the Contractor shall pay for all costs of testing and remediation, if any, and shall compensate the District for any additional costs incurred as a result of Contractor's generation of hazardous material on the Project Site. In addition, the Contractor shall defend, indemnify and hold harmless District and its agents, officers, and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with, arising out of, or relating to, the presence of hazardous material on the Project Site.

10.4.4 Terms of Hazardous Material Provision

The terms of this Hazardous Material provision shall survive the completion of the Work and/or any termination of this Contract.

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ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 Insurance Requirements

Before the commencement of the Work, the Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in California with a financial rating of at least an A-VIII status as rated in the most recent edition of Best's Insurance Reports or as amended by the Supplementary General Conditions, such insurance as will protect the District from claims set forth below, which may arise out of or result from the Contractor's Work under the Contract and for which the Contractor may be legally liable, whether such Work are by the Contractor, by a Subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. Any required insurance shall not contain any exclusion that applies to the type of work performed by the Contractor under the Contract Documents.

- a. Claims for damages because of bodily injury, sickness, disease, or death of any person District would require indemnification and coverage for employee claim;
- b. Claims for damages insured by usual personal injury liability coverage, which are sustained by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor or by another person;
- c. Claims for damages because of injury or destruction of tangible property, including loss of use resulting therefrom, arising from operations under the Contract Documents;
- d. Claims for damages because of bodily injury, death of a person, or property damage arising out of the ownership, maintenance, or use of a motor vehicle, all mobile equipment, and vehicles moving under their own power and engaged in the Work;
- e. Claims involving contractual liability applicable to the Contractor's obligations under the Contract Documents, including liability assumed by and the indemnity and defense obligations of the Contractor and the Subcontractors; and
- f. Claims involving Completed Operations, Independent Contractors' coverage, and Broad Form property damage, without any exclusions for collapse, explosion, demolition, underground coverage, and excavating. (XCU)
- g. Claims involving sudden or accidental discharge of contaminants or pollutants.

11.1.2 Specific Insurance Requirements

Contractor shall take out and maintain and shall require all Subcontractors, if any, whether primary or secondary, to take out and maintain:

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Comprehensive General Liability Insurance with a combined single limit per occurrence of not less than \$2,000,000.00 or Commercial General Liability Insurance which provides limits of not less than:

- | | | |
|-----|-----------------------------------|-------------------------------------|
| (a) | Per occurrence | (combined single \$2,000,000 limit) |
| (b) | Project Specific Aggregate | (for this Project \$2,000,000 only) |
| (c) | Products and Completed Operations | \$2,000,000 (aggregate) |
| (d) | Personal and Advertising Injury | \$1,000,000 Limit |

Insurance Covering Special Hazards

The following Special hazards shall be covered by riders or riders to above mentioned public liability insurance or property damage insurance policy or policies of insurance, in amounts as follows:

- | | | |
|-----|--|----------------|
| (a) | Automotive and truck where operated in amounts | \$1,000,000.00 |
| (b) | Material Hoist where used in amounts | \$1,000,000.00 |
| (c) | Explosion, Collapse and Underground (XCU coverage) | \$1,000,000.00 |
| (d) | Hazardous Materials | \$1,000,000.00 |

In addition, provide Excess Liability Insurance coverage in the amount of Four Million Dollars (\$4,000,000.00).

11.1.3 Subcontractor Insurance Requirements

The Contractor shall require its Subcontractors to take out and maintain public liability insurance and property damage insurance required under Article 11.1 in like amounts. A “claims made” or modified “occurrence” policy shall not satisfy the requirements of Article 11.1 without prior written approval of the District.

11.1.4 Additional Insured Endorsement Requirements

The Contractor shall name, on any policy of insurance required under Article 11.1, the District, CM, Architect, Inspector, the State of California, their officers, employees, agents, volunteers and independent contractors as additional insureds. Subcontractors shall name the Contractor, the District, Architect, Inspector, the State of California, their officers, employees, agents, volunteers and independent contractors as additional insureds. The Additional Insured Endorsement included on all such insurance policies shall be an ISO CG 20 10 (04/13), or an ISO CG 20 38 (04/13), or their equivalent as determined by the District in its sole discretion, and must state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the additional insureds have other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. The insurance provided by the Contractor pursuant to 11.1 must be designated in the policy as primary to any insurance

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obtained by the District. The amount of the insurer's liability shall not be reduced by the existence of such other insurance.

11.2 WORKERS' COMPENSATION INSURANCE

During the term of this Contract, the Contractor shall provide workers' compensation and employer's liability insurance for all of the Contractor's employees engaged in Work under this Contract on or at the Site of the Project and, in case any of the Contractor's Work is subcontracted, the Contractor shall require the Subcontractor to provide workers' compensation insurance for all the Subcontractor's employees engaged in Work under the subcontract. Any class of employee or employees not covered by a Subcontractor's insurance shall be covered by the Contractor's insurance. In case any class of employees engaged in Work under this Contract on or at the Site of the Project is not protected under the Workers' Compensation laws, the Contractor shall provide or cause a Subcontractor to provide insurance coverage for the protection of those employees not otherwise protected. The Contractor shall file with the District certificates of insurance as required under Article 11.6 and in compliance with Labor Code § 3700.

Workers' compensation limits as required by the Labor Code, but not less than \$1,000,000 and employers' liability limits of \$1,000,000 per accident for bodily injury or disease.

11.3 BUILDER'S RISK/ "ALL RISK" INSURANCE

11.3.1 Course-of-Construction Insurance Requirements

The Contractor, during the progress of the Work and until final acceptance of the Work by District upon completion of the entire Contract, shall maintain Builder's Risk, Course of Construction or similar first party property coverage issued on a replacement cost value basis consistent with the total replacement cost of all insurable Work and the Project included within the Contract Documents. Coverage is to insure against all risks of accidental direct physical loss, and must include, by the basic grant of coverage or by endorsement, the perils of vandalism, malicious mischief (both without any limitation regarding vacancy or occupancy), fire, sprinkler leakage, civil authority, sonic boom, earthquake, flood, collapse, wind, lightning, smoke and riot. The coverage must include debris removal, demolition, increased costs due to enforcement of building ordinance and law in the repair and replacement of damage and undamaged portions of the property, and reasonable costs for the Architect's and engineering services and expenses required as a result of any insured loss upon the Work and Project which is the subject of the Contract Documents, including completed Work and Work in progress, to the full insurable value thereof. Such insurance shall include the District and the Architect as additional named insureds, and any other person with an insurable interest as designated by the District.

The Contractor shall submit to the District for its approval all items deemed to be uninsurable. The risk of the damage to the Work due to the perils covered by the "Builder's Risk/All Risk" Insurance, as well as any other hazard which might result in damage to the Work, is that of the Contractor and the Surety, and no Claims for such loss or damage shall be recognized by the District nor will such loss or damage excuse the complete and satisfactory performance of the Contract by the Contractor.

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11.4 FIRE INSURANCE

Before the commencement of the Work, the Contractor shall procure, maintain, and cause to be maintained at the Contractor's expense, fire insurance on all Work subject to loss or damage by fire. The amount of fire insurance shall be sufficient to protect the Project against loss or damage in full until the Work is accepted by the District. This requirement may be waived upon confirmation by the District that such coverage is provided under the Builder's Risk Insurance being provided.

11.5 AUTOMOBILE LIABILITY

11.5.1 The District, Architect and Construction Manager, Inspectors, their directors, officers, employees, agents and volunteers shall be covered as additional insureds with respect to the ownership, operation, maintenance, use, loading or unloading of any auto owned, leased, hired or borrowed by the Contractor or for which the Contractor is responsible. Such insurance coverage shall be primary and non-contributory insurance as respects the District, Architect, Construction Manager, Project Inspector, their directors, officers, employees, agents and volunteers, or if excess, shall stand in an unbroken chain of coverage excess of the Contractor's scheduled underlying coverage. Any insurance or self-insurance maintained by the District, Architect, Construction Manager, Project Inspector, their directors, officers, employees, agents and volunteers shall be excess of the Contractor's insurance and shall not be called upon to contribute with it. The insurer shall agree to waive all rights of subrogation against the District, Architect, Construction Manager, Project Inspector, their directors, officers, employees, agents and volunteers for losses paid under the terms of the insurance policy that arise from Work performed by the Contractor.

11.5.2 Insurance Services Office Business Auto Coverage Form Number CA 0001, Code 1 (any auto) is required. Comprehensive Automobile Liability insurance to include all autos, owned, non-owned, and hired, with limits of \$1,000,000 per accident for bodily injury and property damage.

11.6 OTHER INSURANCE

The Contractor shall provide all other insurance required to be maintained under applicable laws, ordinances, rules, and regulations.

11.7 PROOF OF INSURANCE

The Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract until all required insurance and certificates have been obtained and delivered in duplicate to the District for approval subject to the following requirements:

- a. Certificates and insurance policies shall include the following clause:

“This policy and any coverage shall not be suspended, voided, non-renewed, canceled, or reduced in required limits of liability or amounts of insurance or coverage until notice has been mailed via certified mail to the District. Date of cancellation or reduction may not be less than thirty (30) days after the date of mailing notice.”

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- b. Certificates of insurance shall state in particular those insured, the extent of insurance, location and operation to which the insurance applies, the expiration date, and cancellation and reduction notices.
- c. Certificates of insurance shall clearly state that the District and the Architect are named as additional insureds under the policy described and that such insurance policy shall be primary to any insurance or self-insurance maintained by District.
- d. The Contractor and its Subcontractors shall produce a certified copy of any insurance policy required under this Section upon written request of the District.

11.8 COMPLIANCE

In the event of the failure of Contractor to furnish and maintain any insurance required by this Article 11, the Contractor shall be in default under the Contract. Compliance by Contractor with the requirement to carry insurance and furnish certificates or policies evidencing the same shall not relieve the Contractor from liability assumed under any provision of the Contract Documents, including, without limitation, the obligation to defend and indemnify the District and the Architect.

11.9 WAIVER OF SUBROGATION

Contractor waives (to the extent permitted by law) any right to recover against the District for damages to the Work, any part thereof, or any and all claims arising by reason of any of the foregoing, but only to the extent that such damages and/or claims are covered by property insurance and only to the extent of such coverage (which shall exclude deductible amounts) by insurance actually carried by the District.

The provisions of this Article are intended to restrict each party to recovery against insurance carriers only to the extent of such coverage and waive fully and for the benefit of each, any rights and/or claims which might give rise to a right of subrogation in any insurance carrier. The District and the Contractor shall each obtain in all policies of insurance carried by either of them, a waiver by the insurance companies thereunder of all rights of recovery by way of subrogation for any damages or claims covered by the insurance.

11.10 PERFORMANCE AND PAYMENT BONDS

11.10.1 Bond Requirements

Unless otherwise specified in the Supplemental Conditions, prior to commencing any portion of the Work, the Contractor shall furnish separate Payment and Performance Bonds for its portion of the Work which shall cover 100% faithful performance of and payment of all obligations arising under the Contract Documents and/or guaranteeing the payment in full of all claims for labor performed and materials supplied for the Work. All bonds shall be provided by a corporate Surety authorized and admitted to transact business in California as sureties.

To the extent, if any, that the Contract Price is increased in accordance with the Contract Documents, the Contractor shall, upon request of the District, cause the amount of the bonds to be increased accordingly and shall promptly deliver satisfactory evidence of such increase to the District. To the extent available, the bonds shall further provide that no

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change or alteration of the Contract Documents (including, without limitation, an increase in the Contract Price, as referred to above), extensions of time, or modifications of the time, terms, or conditions of payment to the Contractor will release the Surety. If the Contractor fails to furnish the required bonds, the District may terminate the Contract for cause.

11.10.2 Surety Qualification

Only bonds executed by admitted Surety insurers as defined in Code of Civil Procedure § 995.120 shall be accepted. Surety must be a California-admitted Surety and listed by the U.S. Treasury with a bonding capacity in excess of the Project cost.

11.10.3 Alternate Surety Qualifications

If a California-admitted Surety insurer issuing bonds does not meet these requirements, the insurer will be considered qualified if it is in conformance with § 995.660 of the California Code of Civil Procedure and proof of such is provided to the District.

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ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.1 COMPLIANCE WITH TITLE 24 INSTALLATION REQUIREMENTS

Contractor is aware of the requirements governing Contractor's Work under title 24 Section 4-343 which provides, in pertinent part:

4-343. Duties of the Contractor.

(a) **Responsibilities.** It is the duty of the contractor to complete the Work covered by his or her contract in accordance with the approved Plans and Specifications therefore. The contractor in no way is relieved of any responsibility by the activities of the architect, engineer, Inspector or DSA in the performance of such duties.

(b) **Performance of the Work.** The contractor shall carefully study the approved Plans and Specifications and shall plan a schedule of operations well ahead of time. If at any time it is discovered that Work is being done which is not in accordance with the approved Plans and Specifications, the contractor shall correct the Work immediately. All inconsistencies or items which appear to be in error in the Plans and Specifications shall be promptly called to the attention of the architect or registered engineer, through the Inspector, for interpretation or correction. In no case, however, shall the instruction of the architect or registered engineer be construed to cause Work to be done which is not in conformity with the approved Plans, Specifications, and Change Orders. The contractor must notify the Project Inspector, in advance, of the commencement of construction of each and every aspect of the Work.

12.1.1 Issuance of Notices of Non-Compliance

The Inspector may issue a Notice of Non-Compliance on the Project indicating deviation from Plans and Specifications. It is Contractor's responsibility to correct all deviations from the approved Plans and Specifications unless the District has issued an Immediate Change Directive. In such case, the Contractor shall proceed with the Work with the understandings of the District as set forth in the ICD and as specifically noted in Article 7.3.

12.2 SPECIAL NOTICE OF AMERICAN'S WITH DISABILITIES ACT

Some of the requirements in the Plans and Specifications are meant to comply with the Americans with Disabilities Act ("ADA"). The requirements of the ADA are technical in nature and may appear to be minor in nature (i.e. whether a walkway or ramp has a 2% cross-slope). Contractor is warned that even the slightest deviation from the specific requirements from the ADA is considered a Civil Rights violation and subjects the District to fines of three times actual damages sustained by a handicap individual or up to \$4,000 per violation and attorney's fees required to enforce the ADA violation. As a result of the significant liability and exposure associated with ADA aspects of the Contract, Contractor shall take special care to meet all ADA requirements detailed in the Plans and Specifications. Failure to comply with ADA rules that results in a Notice of Non-Compliance shall be repaired to meet ADA requirements promptly. In addition, any ADA violations that are not identified by Inspector or Architect that are later identified shall be repaired and charged back to the Contractor through a Deductive Change Order.

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12.2.1 Indemnification of ADA Claims

Contractor shall indemnify, hold harmless and defend the District from ADA claims arising from the failure to comply with the Plans and Specifications. Further, any withholdings for ADA violations under Article 9.6 shall include potential redesign costs and an accelerated repair costs due to the potential for ADA claims arising from DSA posting of ADA violations on the Project.

12.3 UNCOVERING OF WORK

12.3.1 Uncovering Work for Required Inspections

Work shall not be covered without the Inspector's review and the Architect's knowledge that the Work conforms with the requirements of the approved Plans and Specifications (except in the case of an ICD under Article 7.3). Inspector must be timely notified of inspections and of new areas so Work can be inspected at least 48 hours before opening a new area (For example, see DSA Form 156 for Commencement/Completion of Work Notification which requires "at least 48 hour" advance notification of a new area). An Inspector must comply with DSA protocols for signing each category or phase of Work under DSA Form 152 (in compliance with the Form 152 Manual) or a Notice of Deviation (DSA Form 154) will be issued requiring the Work that was not inspected be uncovered for inspection. Thus, if a portion of the Work is covered without inspection or Architect approval, is subject to a Notice of Non-Compliance for being undertaken without inspection, or otherwise not in compliance with the Contract Documents, after issuance of a Written Notice of Non-Compliance (Form 154) or a written notice to uncover Work, Contractor shall promptly uncover all Work (which includes furnishing all necessary facilities, labor, and material) for the Inspector's or the Architect's observation and such Work shall be replaced at the Contractor's expense without change in the Contract Sum or Time.

12.3.2 Costs for Inspections Not Required

If a portion of the Work has been covered is believed to be Non-Conforming to the Plans and Specifications, even if the Form 152 for the category of Work has been signed by the Inspector, the Inspector or the Architect may request to see such Work, and it shall be promptly uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncover and replacement shall, by appropriate Change Order and shall, be charged to the District. If such Work is not in accordance with Contract Documents, the Contractor shall be responsible for all costs to uncover the Work, delays incurred to uncover the Work, and Contractor shall pay all costs to correct the Non-Conforming construction condition unless the condition was caused by the District or a separate contractor, in which event the District shall be responsible for payment of such costs to the Contractor.

12.4 CORRECTION OF WORK

12.4.1 Correction of Rejected Work

The Contractor shall promptly correct the Work rejected by the Inspector or the District upon recommendation of the Architect as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not

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Fabricated, installed, or completed. The Contractor shall bear costs of correcting the rejected Work, including cost for delays that may be incurred by Contractor or Subcontractors, the cost for additional testing, inspections, and compensation for the Inspector's or the Architect's services and expenses made necessary thereby (including costs for preparing a CCD, DSA CCD review fees, and additional inspection and special inspection costs).

12.4.2 One-Year Warranty Corrections

If, within one (1) year after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties established under Article 9.9.1, or by the terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the District to do so unless the District has previously given the Contractor a written acceptance of such condition. This period of one (1) year shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation under this Article 12.4.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The District shall give such notice promptly after discovery of the condition.

12.4.3 District's Rights if Contractor Fails to Correct

If the Contractor fails to correct nonconforming Work within a reasonable time, the District may correct the Work and seek a Deductive Change Order, pursuant to Article 9.6 or Article 2.2.

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ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

The District and the Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE

In the absence of specific notice requirements in the Contract Documents, written notice shall be deemed to have been duly served if delivered in person to the individual, member of the firm or entity, or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and Obligations Cumulative

Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

13.4.2 No Waiver

No action or failure to act by the Inspector, the District, or the Architect shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Compliance

Tests, inspections, and approvals of portions of the Work required by the Contract Documents will comply with Division 1, Title 24, and with all other laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction.

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13.5.2 Independent Testing Laboratory

The District will select and pay an independent testing laboratory to conduct all tests and inspections. Selection of the materials required to be tested shall be made by the laboratory or the District's representative and not by the Contractor. See Articles 3.13.1 and 4.3.6 regarding costs or expenses of inspection or testing outside of the Project Site.

13.5.3 Advance Notice to Inspector

The Contractor shall notify the Inspector a sufficient time in advance of its readiness for required observation or inspection so that the Inspector may arrange for same. The Contractor shall notify the Inspector a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents which must, by terms of the Contract Documents, be tested in order that the Inspector may arrange for the testing of the material at the source of supply.

13.5.4 Testing Off-Site

Any material shipped by the Contractor from the source of supply, prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said Inspector that such testing and inspection will not be required, shall not be incorporated in the Work.

13.5.5 Additional Testing or Inspection

If the Inspector, the Architect, the District, or public authority having jurisdiction determines that portions of the Work require additional testing, inspection, or approval not included under Article 13.5.1, the Inspector will, upon written authorization from the District, make arrangements for such additional testing, inspection, or approval. The District shall bear such costs except as provided in Articles 13.5.6 and 13.5.7.

13.5.6 Costs for Retesting

If such procedures for testing, inspection, or approval under Articles 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs arising from such failure, including those of re-testing, re-inspection, or re-approval, including, but not limited to, compensation for the Architect's services and expenses. Any such costs shall be paid by the District, invoiced to the Contractor, and deducted from the next Progress Payment.

13.5.7 Costs for Premature Test

In the event the Contractor requests any test or inspection for the Project and is not completely ready for the inspection, the Contractor shall be invoiced by the District for all costs and expenses resulting from that testing or inspection, including, but not limited to, the Inspector's and Architect's fees and expenses, and the amount of the invoice shall be deducted from the next Progress Payment.

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13.6 TRENCH EXCAVATION

13.6.1 Trenches Greater Than Five Feet

Pursuant to Labor Code section 6705, if the Contract Price exceeds \$25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, submit to the District or a registered civil or structural engineer employed by the District or Architect, a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

13.6.2 Excavation Safety

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the District or by the person to whom authority to accept has been delegated by the District.

13.6.3 No Tort Liability of District

Pursuant to Labor Code § 6705, nothing in this Article shall impose tort liability upon the District or any of its employees.

13.6.4 No Excavation without Permits

The Contractor shall not commence any excavation Work until it has secured all necessary permits including the required CAL OSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

13.7 WAGE RATES, TRAVEL, AND SUBSISTENCE

13.7.1 Wage Rates

Pursuant to the provisions of Article 2 (commencing at § 1720), Chapter 1, Part 7, Division 2, of the Labor Code, the District has obtained the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public works project is to be performed for each craft, classification, or type of worker needed for this Project from the Director of the Department of Industrial Relations ("Director"). These rates are on file at the administrative office of the District and are also available from the Director of the Department of Industrial Relations. Copies will be made available to any interested party on request. The Contractor shall post a copy of such wage rates at appropriate, conspicuous, weatherproof points at the Site.

Any worker employed to perform Work on the Project, but such Work is not covered by any classification listed in the published general prevailing wage rate determinations or per diem wages determined by the Director of the Department of Industrial Relations, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to the employment of such person in such classification.

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13.7.2 Holiday and Overtime Pay

Holiday and overtime work, when permitted by law, shall be paid for at the rate set forth in the prevailing wage rate determinations issued by the Director of the Department of Industrial Relations or at least one and one-half (1½) times the specified basic rate of per diem wages, plus employer payments, unless otherwise specified in the Contract Documents or authorized by law.

13.7.3 Wage Rates Not Affected by Subcontracts

The Contractor shall pay and shall cause to be paid each worker engaged in the execution of the Work on the Project not less than the general prevailing rate of per diem wages determined by the Director, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor and such workers.

13.7.4 Per Diem Wages

The Contractor shall pay and shall cause to be paid to each worker needed to execute the Work on the Project per diem wages including, but not limited to, employer payments for health and welfare, pensions, vacation, travel time and subsistence pay as provided for in Labor Code §1773.1.

13.7.5 Forfeiture and Payments

Pursuant to Labor Code §1775, the Contractor shall forfeit to the District, not more than Two Hundred Dollars (\$200.00) for each calendar day, or portion thereof, for each worker paid less than the prevailing wages rates as determined by the Director of the Department of Industrial Relations, for the work or craft in which the worker is employed for any Work done under the Agreement by the Contractor or by any Subcontractor under it. The amount of the penalty shall be determined by the Labor Commissioner and shall be based on consideration of: (1) whether the Contractor or Subcontractor's failure to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily correct upon being brought to the attention of the Contractor or Subcontractor; and (2) whether the Contractor or Subcontractor has a prior record of failing to meet its prevailing wage obligations.

13.7.6 Monitoring and Enforcement by Labor Commissioner

Monitoring and enforcement of the prevailing wage laws and related requirements will be performed by the Labor Commissioner/ Department of Labor Standards Enforcement (DLSE). The Contractor and all subcontractors shall be required to furnish, at least monthly, certified payroll records directly to the Labor Commissioner in accordance with Labor Code section 1771.4. All payroll records shall be furnished in a format required by the Labor Commissioner. The Contractor and all subcontractors must sign up for, and utilize, the Labor Commissioner's electronic certified payroll records submission system. The District will have direct and immediate access to all CPRs for the Project that are submitted through the Labor Commissioner's system. The District can use this information for any appropriate purpose, including monitoring compliance, identifying suspected violations, and responding to Public Records Act requests.

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The Labor Commissioner/ DLSE may conduct various compliance monitoring and enforcement activities including, but not limited to, confirming the accuracy of payroll records, conducting worker interviews, conducting audits, requiring submission of itemized statements prepared in accordance with Labor Code section 226, and conducting random in-person inspections of the Project site (“On-Site Visits”). On-Site Visits may include inspections of records, inspections of the Work site and observation of work activities, interviews of workers and others involved with the Project, and any other activities deemed necessary by the Labor Commissioner/DLSE to ensure compliance with prevailing wage requirements. The Labor Commissioner/DLSE shall have free access to any construction site or other place of labor and may obtain any information or statistics pertaining to the lawful duties of the Labor Commissioner/DLSE.

Any lawful activities conducted or any requests made by the Labor Commissioner/DLSE shall not be the basis for any delays, claims, costs, damages or liability of any kind against the District by the Contractor. Contractor and all subcontractors shall cooperate and comply with any lawful requests by the Labor Commissioner/ DLSE. The failure of the Labor Commissioner, DLSE, or any other entity related to the Department of Industrial Relations to comply with any requirement imposed by the California Code of Regulations, Title 8, Chapter 8 shall not of itself constitute a defense to the failure to pay prevailing wages or to comply with any other obligation imposed by Division 2, Part 7, Chapter 1 of the Labor Code.

Prior to commencing any Work on the Project, the Contractor shall post the required notice/poster required under the California Code of Regulations and Labor Code section 1771.4 in both English and Spanish at a conspicuous, weatherproof area at the Project site. The required notice/poster is available on the Labor Commissioner’s website.

13.8 RECORDS OF WAGES PAID

13.8.1 Payroll Records

- a. Pursuant to §1776 of the Labor Code, the Contractor and each Subcontractor shall keep an accurate payroll record showing the name, address, social security number, work classification and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed by him or her in connection with the Project.

All payroll records as specified in Labor Code §1776 of the Contractor and all Subcontractors shall be certified and furnished directly to the Labor Commissioner in accordance with Labor Code §1771.4(a)(3) on a monthly basis (or more frequently if required by the District or the Labor Commissioner) and in a format prescribed by the Labor Commissioner. Payroll records as specified in Labor Code §1776 shall be certified and submitted to the District with each application for payment. All payroll records shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

1. A certified copy of an employee’s payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.

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2. A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of District, the Division of Labor Standards Enforcement or the Division of Apprenticeship Standards of the Department of Industrial Relations.
 3. A certified copy of all payroll records shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to Paragraph (2) above, the requesting party shall, prior to being provided the records, reimburse the costs, according to law for the preparation by the Contractor, Subcontractor(s), and the entity through which the request was made. The public shall not be given access to such records at the principal office of the Contractor.
- b. The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the Division of Labor Standards Enforcement.
 - c. The Contractor or Subcontractor(s) shall file a certified copy of all payroll records with the entity that requested such records within 10 calendar days after receipt of a written request.
 - d. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor awarded the Contract or the Subcontractor(s) performing the Contract shall not be marked or obliterated. Any copy of records made available for inspection by, or furnished to, a joint labor-management committee established pursuant to the federal Labor Management Cooperation Act of 1978 (Section 175a of Title 29 of the United States Code) shall be marked or obliterated only to prevent disclosure of an individual's name and social security number. Notwithstanding any other provision of law, agencies that are included in the Joint Enforcement Strike Force on the Underground Economy established pursuant to Section 329 of the Unemployment Insurance Code and other law enforcement agencies investigating violations of law shall, upon request, be provided non-redacted copies of certified payroll records.
 - e. The Contractor shall inform the District of the location of all payroll records, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.
 - f. The Contractor or Subcontractor(s) shall have 10 calendar days in which to comply subsequent to receipt of a written notice requesting payroll records. In the event that the Contractor or Subcontractor(s) fails to comply within the 10-day period, the Contractor or Subcontractor(s) shall, as a penalty to the District, forfeit One Hundred Dollars (\$100.00) for each calendar day, or portion thereof, for each

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worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

Responsibility for compliance with this Article shall rest upon the Contractor.

13.8.2 Withholding of Contract Payments & Penalties

The District may withhold or delay contract payments to the Contractor and/or any Subcontractor if:

- a. The required prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations is not paid to all workers employed on the Project; or
- b. The Contractor or Subcontractor(s) fail to submit all required certified payroll records with each application for payment, but not less than once per month; or
- c. The Contractor or Subcontractor(s) submit incomplete or inadequate payroll records; or
- d. The Contractor or Subcontractor(s) fail to comply with the Labor Code requirements concerning apprentices; or
- e. The Contractor or Subcontractor(s) fail to comply with any applicable state laws governing workers on public works projects.

13.9 APPRENTICES

13.9.1 Apprentice Wages and Definitions

All apprentices employed by the Contractor to perform services under the Contract shall be paid the standard wage paid to apprentices under the regulations of the craft or trade for which he or she is employed, and as determined by the Director of the Department of Industrial Relations, and shall be employed only at the craft or trade to which he or she is registered. Only apprentices, as defined in §3077 of the Labor Code, who are in training under apprenticeship standards that have been approved by the Chief of the Division of Apprenticeship Standards and who are parties to written apprenticeship agreements under Chapter 4 (commencing with §3070) of Division 3, are eligible to be employed under this Contract. The employment and training of each apprentice shall be in accordance with the apprenticeship standards and apprentice agreements under which he or she is training, or in accordance with the rules and regulations of the California Apprenticeship Council.

13.9.2 Employment of Apprentices

Contractor agrees to comply with the requirements of Labor Code §1777.5. The Contractor awarded the Project, or any Subcontractor under him or her, when performing any of the Work under the Contract or subcontract, employs workers in any apprenticeable craft or trade, the Contractor and Subcontractor shall employ apprentices in the ratio set forth in Labor Code §1777.5. The Contractor or any Subcontractor must apply to any apprenticeship program in the craft or trade that can provide apprentices to the Project site

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for a certificate approving the contractor or subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, the decision of the apprenticeship program to approve or deny a certificate shall be subject to review by the Administrator of Apprenticeship. The apprenticeship program or programs, upon approving the Contractor or Subcontractor, shall arrange for the dispatch of apprentices to the Contractor or Subcontractor upon the Contractor's or Subcontractor's request. "Apprenticeable craft or trade" as used in this Article means a craft or trade determined as an apprenticeable occupation in accordance with the rules and regulations prescribed by the California Apprenticeship Council. The ratio of work performed by apprentices to journeyman employed in a particular craft or trade on the Project shall be in accordance with Labor Code §1777.5.

13.9.3 Submission of Contract Information

Prior to commencing Work on the Project, the Contractor and Subcontractors shall submit contract award information to the applicable apprenticeship program(s) that can supply apprentices to the Project and make the request for the dispatch of apprentices in accordance with the Labor Code. The information submitted shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices proposed to be employed, and the approximate dates the apprentices would be employed. A copy of this information shall also be submitted to the District if requested. Within 60 days after concluding Work on the Project, the Contractor and Subcontractors shall submit to the District, if requested, and to the apprenticeship program a verified statement of the journeyman and apprentice hours performed on the Project.

13.9.4 Apprentice Fund

The Contractor or any Subcontractor under him or her, who, in performing any of the Work under the Contract, employs journeymen or apprentices in any apprenticeable craft or trade shall contribute to the California Apprenticeship Council the same amount that the Director determines is the prevailing amount of apprenticeship training contributions in the area of the Project. The Contractor and Subcontractors may take as a credit for payments to the California Apprenticeship Council any amounts paid by the Contractor or Subcontractor to an approved apprenticeship program that can supply apprentices to the Project. The Contractor and Subcontractors may add the amount of the contributions in computing his or her bid for the Contract.

13.9.5 Prime Contractor Compliance

The responsibility of compliance with Article 13 and §1777.5 of the Labor Code for all apprenticeable occupations is with the Prime Contractor. Any Contractor or Subcontractor that knowingly violates the provisions of this Article or Labor Code §1777.5 shall be subject to the penalties set forth in Labor Code §1777.7.

13.10 ASSIGNMENT OF ANTITRUST CLAIMS

13.10.1 Application

Pursuant to Government Code § 4551, in entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the

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Contractor or Subcontractor offers and agrees to assign to the District all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act, (15 U.S.C. § 15) or under the Cartwright Act (Chapter 2 [commencing with § 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from the purchase of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders Retention Payment to the Contractor, without further acknowledgment by the parties. If the District receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Chapter 11 (commencing with § 4550) of Division 5 of Title 1 of the Government Code, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the District any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the District as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

13.10.2 Assignment of Claim

Upon demand in writing by the assignor, the District shall, within one (1) year from such demand, reassign the cause of action assigned pursuant to this Article if the assignor has been or may have been injured by the violation of law for which the cause of action arose and the District has not been injured thereby or the District declines to file a court action for the cause of action.

13.11 STATE AND DISTRICT CONDUCTED AUDITS

Pursuant to and in accordance with the provisions of Government Code § 10532, or any amendments thereto, all books, records, and files of the District, the Contractor, or any Subcontractor connected with the performance of this Contract involving the expenditure of state funds in excess of Ten Thousand Dollars (\$10,000.00), including, but not limited to, the administration thereof, shall be subject to the examination and audit of the Office of the Auditor General of the State of California for a period of five (5) years after Retention Payment is made or a Notice of Completion is Recorded, whichever occurs first. Contractor shall preserve and cause to be preserved such books, records, hard drives, electronic media, and files for the audit period.

Pursuant to the remedies under Public Contract Code section 9201 and Government Code section 930.2, Contractor, through execution of this Agreement, also agrees the District shall have the right to review and audit, upon reasonable notice, the books and records of the Contractor concerning any monies associated with the Project. The purpose of this “Audit” is to quickly and efficiently resolve Disputes or Claims based on the actual costs incurred and to reduce the uncertainty in resolving Disputes or Claims with limited information. The District shall perform any audits at its own cost and any such audit shall be performed by an independent auditor, having no direct or indirect relationship with the functions or activities being audited or with the business conducted by the Contractor or District. In the event the independent auditor determines that Change Orders, response to Request for Proposals, Disputes, Claims, or other requests for payment are in error, or have any other concerns or questions, the Auditor shall report the results of the Audit findings to the District and provide a copy to the Contractor after giving the District Board the opportunity for at least 10 days review. If the Contractor disputes the findings of the independent auditor, such dispute shall be handled in the manner set forth under Article 4.6.2.

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If Contractor having agreed to the terms of this Contract fails to produce books or records requested by Auditor, such failure to produce books or records that were required to be preserved for audit, it shall be presumed that the information contained in the withheld books or records were unfavorable to the Contractor and the Auditor shall note this refusal in the results of the Audit findings for further evaluation by the District and the District's Board. The refusal to release records that are concerning monies associated with the Project may be used as a grounds to debar the Contractor under Article 15 for failure to preserve records under Article 13.11 and the failure to produce required audit records may also be used as a grounds for a negative finding against the Contractor depending on the significance of the records that are withheld by Contractor. Failure to produce job cost data tied to job cost categories and budgets shall be presumed an intentional failure to produce key audit records. Similarly, failure to produce Daily Reports (prepared at or near the time of the Work actually took place (See Article 3.16) shall be presumed an intentional failure to produce key audited records.

If Contractor is seeking costs for inefficiency, home office overhead, or unanticipated increased costs due to delays or acceleration, Contractor shall also produce copies of the original bid tabulation utilized in submitting Contractor's bid for the Project. This document shall be considered confidential and shall not be subject to disclosure through a Public Records Act and shall not be distributed to anyone other than the District and the District's counsel. This bid tabulation shall only be used in litigation, arbitration, evaluation of Claims or Disputes, Audit, and trial. If the records for the bid tabulation are kept on a computer, the Contractor shall also produce all metadata (in native format) that accompanies the bid tabulation for inspection to prove the authenticity of the underlying bid tabulation. Failure to produce the bid tabulation for review of inefficiency, home office overhead, or unanticipated increased costs due to delays or accelerations shall be considered material evidence that the bid tabulation was not favorable to the Contractor. This evidence shall be entered as a jury instruction for trial that the bid tabulation was not produced and the bid tabulation information was unfavorable to the Contractor. The evidence may also be used in debarment proceedings, and noted as an exception to an Audit findings.

Upon notification of Contractor concerning the results of the audit and a reasonable time has passed for Contractor to respond to the Audit findings and if either there is no Dispute of the Audit findings under Article 4.6 or if the result after utilizing the Disputes Clause confirms the Audit findings, the District may seek reimbursement for overstated Disputes, Claims, or Change Orders and may also undertake debarment proceedings under Article 15 of these General Conditions.

13.12 STORM WATER POLLUTION PREVENTION

13.12.1 Application

This Section addresses the preparation, implementation and monitoring of a Storm Water Pollution Prevention Plan (SWPPP) for the purpose of preventing the discharge of pollutants from the construction site. This includes the elimination of pollution discharges such as improper dumping, spills or leakage from storage tanks or transfer areas. The District will not issue a Notice to Proceed until Contractor has prepared by a qualified individual and obtained approval of the Permit Registration Documents ("PRDs") that include a Notice of Intent, Construction Risk Calculation, Site Map, SWPPP, Annual Fee and any additional required documents from all applicable Local Governing Agencies including the Regional Water Quality Control Board. The Contractor shall also secure a certification that the Project has met all of the conditions of the General Construction Activity Storm Water Permit (GCASP) and comply with all

GENERAL CONDITIONS

applicable local, state and federal regulations governing storm water pollution prevention.

13.12.2 References and Materials

- California Stormwater Quality Association New Development and Redevelopment Best Management Practice Handbook
- 2009 California Stormwater Quality Association Construction BMP Handbook .
- State Water Resources Control Board (2009). Order 2009-0009-DWQ, NPDES General Permit No. CAS000002: Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbing Activities. Available on-line at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.
Use materials of a class, grade and type needed to meet the performance described in the BMP Handbook.

13.12.3 Preparation and Approval

The Contractor shall prepare by a qualified individual the PRDs that include a Notice of Intent, Construction Risk Calculation, Site Map, SWPPP, Annual Fee and any additional required documents. The Contractor's Qualified SWPPP Developer ("QSD") shall prepare the Storm Water Pollution Prevention Plan (SWPPP) as required to comply with storm water pollution regulations for project sites with storm water discharges associated with construction activity such as clearing or demolition, grading, excavation and other land disturbances. The SWPPP shall apply to all areas that are directly related to construction activity, including but not limited to staging areas, storage yards, material borrow areas, and access roads.

- 13.12.3.1 The Contractor shall prepare and submit to the Local Governing Agencies and the District the SWPPP for review and approval if the project sites, new or existing, with land disturbance of 1 or more acres (or less than 1 acres if part of a common plan of development); the construction activity that results in land surface disturbances of less than one acre is part of a larger common plan of development or sale of one or more acres of disturbed land surface; or the construction activity associated with Linear Underground/Overhead Projects ("LUPs") including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

GENERAL CONDITIONS

13.12.3.2 The Contractor shall also pay annual renewal fee(s) until the contract is completed and make all such checks payable to the State Water Resources Control Board. The Notice of Intent must be submitted at least two weeks prior to the commencement of construction activities.

13.12.3.3 The Contractor shall prepare the SWPPP by following the format in Sections 2, 3, 4 and Appendices A through F of the California Stormwater BMP Handbook - Construction, January 2009 edition, published by the California Stormwater Quality Association. The publication is available from:
California Stormwater
Quality Association
P.O. Box 2105
Menlo Park, CA 94026-2105
Phone: (650) 366-1042
E-mail: info@casqa.org

or

<https://www.casqa.org/store/products/tabid/154/p-167-construction-handbookportal-initial-subscription.aspx>

13.12.3.4 Where land disturbance is less than 1 acre, any BMPs indicated in the BMP Handbook needed to prevent or minimize storm water pollution shall be implemented at no extra cost to the District.

13.12.3.5 Within two weeks after Award of Contract by the District, the Contractor shall submit to the District's Civil Engineer one copy of the PRDs including the SWPPP for review. After the District's approval, the Contractor shall provide approved copies of the SWPPP as follows: one copy each to the Project Inspector, Construction Manager, Architect, Commissioned Architect and District's Civil Engineer.

13.12.4 Implementation

The Contractor shall implement the Storm Water Pollution Prevention Plan by doing the following:

- a. Obtain a Waste Discharger Identification (WDID) number from the SWRCB before beginning construction. This number will be issued once your PRDs are administratively accepted and fee is received.
- b. Keep the SWPPP, REAPs, monitoring data on the construction site.
- c. Employ a Qualified SWPPP Practitioner (QSP) to implement the SWPPP during construction and develop Rain Event Action Plans ("REAPs").
- d. Install, inspect, maintain and monitor BMPs required by the General Permit.
- e. Install perimeter controls prior to starting other construction work at the site.

GENERAL CONDITIONS

- f. Contain on-site storm water at the jobsite. Do not drain on-site water directly into the storm drain.
- g. Implement the SWPPP.
- h. Provide SWPPP and BMP implementation training for those responsible for implementing the SWPPP.
- i. Designate trained personnel for the proper implementation of the SWPPP.
- j. Conduct monitoring, as required, and assess compliance with the Numeric Action Levels (NALs) or Numeric Effluent Limitations (NELs) appropriate to your project.
- k. Report monitoring data:
 - 1. Maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed.
 - 2. Have a QSD revise the SWPPP as needed to reflect the phases of construction and to suit changing site conditions and instances when properly installed systems are ineffective.
 - 3. Assist the District with entering any necessary data or information into the Stormwater Multi-Application and Reporting System (“SMARTS”) system.
- l. At the end of Construction Contract:
 - 1. Submit Notice of Termination (NOT) into the SMARTS when construction is complete and conditions of termination listed in the NOT have been satisfied. A copy of the NOT can be found at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.
 - 2. Leave in place storm water pollution prevention controls needed for post-construction storm water management and remove those that are not needed as determined by the District. Thereafter, left-in-place controls will be maintained by the District.
 - 3. Provide Site Monitoring Reports, SWPPP revisions, Compliance Certifications and related documents to the District. Post-construction storm water operation and management plan as mentioned in the compliance certifications are considered to be in place at the end of the Construction Contract.

13.12.5 Monitoring

The Contractor shall conduct examination of storm water pollution prevention controls as required by the State Water Resources Control Board (2009). Order 2009-0009-DWQ, NPDES General

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Permit No. CAS000002: Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbing Activities. This includes properly qualified personnel performing all required monitoring, testing, inspections and monitoring. The Contractor shall also conduct examination of storm water pollution prevention controls, as well as before and after each storm event in compliance with the State Water Resources Control Board Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities (General Permit) (SWRCB, 2009).and at least once each 24-hour period during extended storm events to identify BMP effectiveness and implement repairs or BMP changes as soon as feasible. All maintenance related to a storm event should be completed within 48 hours of the storm event. The Contactor shall also prepare and maintain, at the jobsite, a log of each inspection using Site Monitoring Report forms.

13.12.6 Liabilities and Penalties

- a. Review of the SWPPP and inspection logs by the District shall not relieve the Contractor from liabilities arising from non-compliance with storm water pollution regulations.
- b. Payment of penalties for non-compliance by the Contractor shall be the sole responsibility of the Contractor and will not be reimbursed by the District.
- c. Compliance with the Clean Water Act pertaining to construction activity is the sole responsibility of the Contractor. For any fine(s) levied against the District due to non-compliance by the Contractor, the District will deduct from the final payment due the Contractor the total amount of the fine(s) levied on the District, plus legal and associated costs.
- d. The Contractor shall submit to the District a completed NOI for change of information (Construction Site Information and Material Handling/Management Practices).

GENERAL CONDITIONS

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR FOR CAUSE

14.1.1 Grounds for Termination

The Contractor may terminate the Contract if the Work is stopped for a period of thirty (30) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons performing portions of the Work for whom the Contractor is contractually responsible, for only the following reasons:

- a. Issuance of an order of a court or other public authority having jurisdiction; or
- b. An act of the United State or California government, such as a declaration of national emergency.

14.1.2 Notice of Termination

If one of the above reasons exists, the Contractor may, upon written notice of seven (7) additional days to the District, terminate the Contract and recover from the District payment for Work executed and for reasonable costs verified by the Architect with respect to materials, equipment, tools, construction equipment, and machinery, including reasonable overhead, profit, and damages.

14.2 TERMINATION BY THE DISTRICT FOR CAUSE

14.2.1 Grounds for Termination

The District may terminate the Contractor and/or this Contract for the following reasons:

- a. Persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- b. Persistently or repeatedly is absent, without excuse, from the job site;
- c. Fails to make payment to Subcontractors, suppliers, materialmen, etc.;
- d. Persistently disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction;
- e. Fails to provide a schedule or fails or refuses to update schedules required under the Contract;
- f. Falls behind on the Project and refuses or fails to undertake a Recovery Schedule;
- g. If the Contractor has been debarred from performing Work
- h. Becomes bankrupt or insolvent, including the filing of a general assignment for the benefit of creditors; or

GENERAL CONDITIONS

- i. Otherwise is in substantial breach of a provision of the Contract Documents.

14.2.2 Notification of Termination

When any of the above reasons exist, the District may, without prejudice to any other rights or remedies of the District and after giving the Contractor and the Contractor's Surety written notice of seven (7) days, terminate the Contractor and/or this Contract and may, subject to any prior rights of the Surety:

- a. Take possession of the Project and of all material, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- b. Accept assignment of Subcontracts. Contractor acknowledges and agrees that if the District (in its sole and absolute discretion) decides to takeover completion of the Project, the Contractor agrees to immediately assign all subcontracts to the District which the District has chosen to accept;
- c. Complete the Work by any reasonable method the District may deem expedient, including contracting with a replacement contractor or contractors; and,
- d. Agree to accept a takeover and completion arrangement with Surety that is acceptable to the District Board.

14.2.3 Takeover and Completion of Work after Termination for Cause

A Termination for Cause is an urgent matter which requires immediate remediation since Project Work is open and incomplete, the site is subject to vandalism and theft, the Project site is considered a public nuisance, and there is a possibility of injury and deterioration of the Project Work and materials. Thus, the District shall be entitled to enter a takeover contract to either remediate the unfinished condition or complete the Work for this Project.

14.2.4 Payments Withheld

If the District terminates the Contract for one of the reasons stated in Article 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is complete. All costs associated with the termination and completion of the Project shall be the responsibility of the Contractor and/or its Surety.

14.2.5 Payments upon Completion

If the unpaid balance of the Contract Sum exceeds costs of completing the Work, including compensation for professional services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor and its Surety shall pay the difference to the District. The amount to be paid to the Contractor, or District, as the case may be, shall be certified by the Architect upon application. This payment obligation shall survive completion of the Contract.

GENERAL CONDITIONS

14.3 TERMINATION OF CONTRACT BY DISTRICT (CONTRACTOR NOT AT FAULT)

14.3.1 Termination for Convenience

District may terminate the Contract upon fifteen (15) calendar days of written notice to the Contractor and use any reasonable method the District deems expedient to complete the Project, including contracting with replacement contractor or contractors, if it is found that reasons beyond the control of either the District or Contractor make it impossible or against the District's interest to complete the Project. In such a case, the Contractor shall have no Claims against the District except for: (1) the actual cost for approved labor, materials, and services performed in accordance with the Contract Documents which have not otherwise been previously paid for and which are supported and documented through timesheets, invoices, receipts, or otherwise; and (2) profit and overhead of ten percent (10%) of the approved costs in item (1); and (3) termination cost of five percent (5%) of the approved costs in item (1). Contractor acknowledges and agrees that if the District (in its sole and absolute discretion) decides to takeover completion of the Project, the Contractor agrees to immediately assign all subcontracts to the District which the District has chosen to accept.

14.3.2 Non-Appropriation of Funds/ Insufficient Funds

In the event that sufficient funds are not appropriated to complete the Project or the District determines that sufficient funds are not available to complete the Project, District may terminate or suspend the completion of the Project at any time by giving written notice to the Contractor. In the event that the District exercises this option, the District shall pay for any and all work and materials completed or delivered onto the site for which value is received, and the value of any and all work then in progress and orders actually placed which cannot be canceled up to the date of notice of termination. The value of work and materials not otherwise already paid for by the District up to the time of termination under this Paragraph shall include a factor of fifteen percent (15%) for the Contractor's overhead and profit and there shall be no other costs or expenses paid to Contractor. All work, materials and orders paid for pursuant to this provision shall become the property of the District. District may, without cause, order Contractor in writing to suspend, delay or interrupt the Project in whole or in part for such period of time as District may determine. Adjustment shall be made for increases in the cost of performance of the Agreement caused by suspense, delay or interruption.

14.4 REMEDIES OTHER THAN TERMINATION

If a default occurs, the District may, without prejudice to any other right or remedy, including, without limitation, its right to terminate the Contract pursuant to Article 14.2, do any of the following:

- a. Permit the Contractor to continue under this Contract, but make good such deficiencies or complete the Contract by whatever method the District may deem expedient, and the cost and expense thereof shall be deducted from the Contract Price or paid by the Contractor to the District on demand;
- b. If the workmanship performed by the Contractor is faulty or defective materials are provided, erected or installed, then the District may order the Contractor to remove the faulty workmanship or defective materials and to replace the same with work or materials that conform to the Contract Documents, in which event the Contractor, at its sole costs

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and expense, shall proceed in accordance with the District's order and complete the same within the time period given by the District in its notice to the Contractor; or

- c. Initiate procedures to declare the Contractor a non-responsible bidder for a period of two (2) to five (5) years thereafter.

All amounts expended by the District in connection with the exercise of its rights hereunder shall accrue interest from the date expended until paid to the District at the maximum legal rate. The District may retain or withhold any such amounts from the Contract Price. If the Contractor is ordered to replace any faulty workmanship or defective materials pursuant to Paragraph (b) above, the Contractor shall replace the same with new work or materials approved by the Architect and the District, and, at its own cost, shall repair or replace, in a manner and to the extent the Architect and the District shall direct, all Work or material that is damaged, injured or destroyed by the removal of said faulty workmanship or defective material, or by the replacement of the same with acceptable work or materials. In no event shall anything in this Article be deemed to constitute a waiver by the District of any other rights or remedies that it may have at law or in equity, it being acknowledged and agreed by the Contractor that the remedies set forth in this Article are in addition to, and not in lieu of, any other rights or remedies that the District may have at law or in equity.

ARTICLE 15 DEBARMENT

15.1 DEBARMENT MEANS THERE HAS BEEN A FINDING THAT THE CONTRACTOR IS NOT RESPONSIBLE.

During the course of the Project, or if it is determined through Change Orders, Claims, or Audit that a Contractor is not responsible, the District may, in addition to other remedies provided in the Contract, debar the Contractor from bidding or proposing on, or being awarded, and/or performing work on District contracts for a specified period of time, which generally will not exceed five (5) years, but may exceed five (5) years or be permanent if the circumstances warrant such debarment. In addition to the debarment proceeding, a finding that a Contractor is to be debarred shall result in the termination of any or all existing Contracts the Contractor may have with the District.

15.2 BOARD FINDING

The District may debar a Contractor if the Board, or the Board's delegatee, in its discretion, finds the Contractor has done any of the following:

15.2.1 Intentionally or with reckless disregard, violated any term of the Contract with the District

15.2.2 Committed an acts or omission which reflects on the Contractor's quality, fitness or capacity to perform Work for the District;

15.2.3 Committed an act or offense which indicates a lack of business integrity or business honesty; or,

15.2.4 Made or submitted a false claim against the District or any other public entity.

15.3 HEARING AND PRESENTATION OF EVIDENCE

If there is evidence that the Contractor may be subject to debarment, the District shall notify the Contractor in writing of the evidence which is the basis for the proposed debarment and shall advise the Contractor of the scheduled date for a debarment hearing before the District Board or its delegated designee.

The District Board, or designee, shall conduct a hearing where evidence on the proposed debarment is presented. The Contractor or the Contractor's representative shall be given an opportunity to submit evidence at the hearing. The Contractor shall be provided an adequate amount of time to prepare and object to evidence presented. A tentative proposed decision shall be issued as a tentative decision and the District shall be entitled to modify, deny or adopt the proposed decision. The proposed decision shall contain a recommendation regarding whether the Contractor should be debarred, and, if so, the appropriate length of time of the debarment. The Contractor and the District shall be provided an opportunity to object to the tentative proposed decision for a period of 15 days. If additional evidence is presented, the District shall evaluate this evidence and either issue an amended ruling, issue the same ruling, or call a further hearing.

If a Contractor has been debarred for a period of longer than five (5) years, that Contractor may after the debarment has been in effect for at least five (5) years, submit a written request for review of the debarment determination to reduce the period of debarment or terminate the debarment. The District may,

in its discretion, reduce the period of debarment or terminate the debarment if it finds that the Contractor has adequately demonstrated one or more of the following: (1) elimination of the grounds for which the debarment was imposed; (2) a bona fide change in ownership or management; (3) material evidence discovered after debarment was imposed; or (4) any other reason that is in the best interests of the District.

The District will consider a request for review of a debarment determination only where: (1) the Contractor has been debarred for a period longer than five (5) years; (2) the debarment has been in effect for at least five (5) years; and (3) the request is in writing, states one or more of the grounds for reduction of the debarment period or termination of the debarment, and includes supporting documentation. Upon receiving an appropriate request, the District will provide notice of the hearing on the request. At the hearing, the District shall review evidence on the proposed reduction of debarment period. This hearing shall be conducted and the request for review decided by the District pursuant to the same procedures as for a debarment hearing.

The District's proposed decision shall contain a recommendation on the request to reduce the period of debarment or terminate the debarment.

The terms shall also apply to Subcontractors of Contractor.

SITE LOCATION

SAN DIMAS HIGH SCHOOL
800 W COVINA BLVD
SAN DIMAS, CA 91773

BONITA HIGH SCHOOL
3102 D STREET
LA VERNE, CA 91750

SPECIFICATIONS



San Dimas High School

Gymnasium HVAC Replacement

November 12, 2021

File No. 19-H3
03-122101

Prepared by Architecture 9 PLLLP



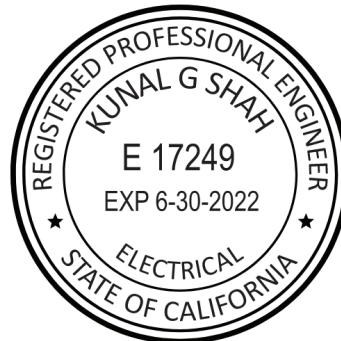
SPECIFICATIONS

Project:	San Dimas High School Gymnasium HVAC Replacement
District:	Bonita Unified School District
Architect:	Architecture 9 PLLLP 8816 Foothill Boulevard #103-224 Rancho Cucamonga, California 91730



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C-28546



Kunal Shah, P.E. RCDD, LEED AP
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E-17249



Tariq A. Hassan
MECHANICAL ENGINEER

M-33827



Peter R. Ravenkamp
STRUCTURAL ENGINEER

SPECIFICATIONS

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BONITA UNIFIED SCHOOL DISTRICT

SAN DIMAS HIGH SCHOOL GYMNASIUM HVAC REPLACEMENT NOVEMBER 12, 2021

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Requirements in General Conditions apply to this Work.

1.03 SCOPE OF WORK (SITE CONTRACTOR)

- A. Work of the Contractor: Perform, within the time stipulated, the contract, including its component parts, and everything required to be performed, and to provide and furnish labor, materials, tools, expendable equipment, and applicable taxes, and utility and transportation services necessary to perform the contract and complete, in a workmanlike matter, the Work required in connection with the following titled Project in strict conformity with the Contract Documents.
- B. Project Scope of Work:
 - 1. **Base Bid:** Work to include but not be limited to Gymnasium HVAC replacement, Toilet and Parking lot accessibility upgrades.
- C. Time for Completion, Liquidated Damages, Work Sequence:
 - 1. Reference: See General Conditions and Agreement.
 - 2. Time limit(s) for completion of the Work are:
 - a. The Work is to be completed in accordance with the time limit(s) stated in the Agreement.
 - 3. Agreed Liquidated Damages shall be as stated in Agreement.

1.04 WORK SEQUENCE

- A. Work to be continuous from Notice to Proceed to Completion.

1.05 USE OF PREMISES

- A. Contractor shall limit use of premises to allow:
 - 1. Owner occupancy.
 - 2. Public usage.
 - 3. Work by other contractors.

- B. Coordinate use of premises under direction of Owner.
- C. Assume full responsibility for protection and safekeeping of products under this Contract.
- D. Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- E. Noise Control: The Contractor is advised that the District prohibits high noise activities, such as jack-hammering, between the hours of 8:00 AM and 3:00 PM, Monday through Friday, while school is in session. Coordinate with District.

1.06 OWNER OCCUPANCY

Owner will occupy premises during entire construction period for conduct of his normal operations. Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.

1.07 CHANGES IN THE WORK

- A. Changes in the Work shall be done by Addenda or Change Order, only with in accordance with Title 24, Part I, Section 4-338, as follows:
 - 1. General: Work shall be executed in accordance with the approved Drawings, addenda and change orders. Changes in the Drawings and Specifications shall be made by addenda or change orders.
 - 2. Addenda: Changes or alterations of the approved Drawings or Specifications prior to letting a construction contract for the work involved shall be made by means of addenda to contractors. Original copies of addenda shall be manually signed by the Architect or Engineer in general responsible charge of preparation of the Drawings and Specifications and by the Architect or registered Engineer delegated responsibility for the portion affected by the addenda.
 - 3. Change Orders: Changes or alterations of the approved Drawings or Specifications after a Contract for the Work has been let shall be made only by means of change orders prior to commencement of the Work shown thereon. Change orders shall state the reason for the change and the scope of work to be accomplished, and, where necessary, shall be accompanied by supplementary drawings referenced in the text of the change order. All change orders and supplementary drawings shall be manually signed by the Architect or Engineer in general responsible charge of observation of the Work of construction of the Project and by the Architect or registered Engineer delegated responsibility for observation of the portion of the Work of construction affected by the change order, shall bear the approval of the District and shall indicate the associated change in the Project cost, if any.
 - 4. Field Change Documents: In order to expedite construction, field change documents may be submitted. Field change documents shall meet all the requirements necessary for a change order, with the exception of the

approval of the District and the associated change, if any, in costs. The field change document does not require the stamp or seal, but does require the signature of the Architect or Engineers. Work may proceed in accordance with the approved field change document. An official change order shall be submitted to follow up on the field change document as soon as possible.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specified administrative and procedural requirements governing Contract allowances.
 - 1. Allowances as set forth in the Specification are to be used as compensation for items as set forth in this Section. The amounts listed in the schedule and/or Specifications are to be included in the base bid and shall be listed separately in the Schedule of Values and Application for Payment.

1.02 RELATED SECTIONS

- A. Divisions 2-16: Specifications

1.03 ALLOWANCES

- A. Use the allowances only as authorized for DISTRICT purposes and only by an approved allowance disbursement form that indicate the amounts to be charged to the respective allowance amount.
- B. At Substantial Completion of the Work or at any time designated by the ARCHITECT and DISTRICT credit unused amounts remaining in the allowances to the DISTRICT by Change Order.

1.04 ALLOWANCE DISBURSEMENT

- A. CONTRACTOR shall submit a request for allowance disbursement on an allowance disbursement form. Include all substantiating and/or required data along with the request.
- B. The request shall have the requested amount listed as an allowance disbursement without CONTRACTOR overhead and markup.
- C. Once the ARCHITECT and DISTRICT has accepted the disbursement, ARCHITECT and ARCHITECT will sign the allowance disbursement form.

1.05 SCHEDULE OF ALLOWANCES

- A. Include in the base bid the following allowances in the following amounts:

<u>Section</u>	<u>Description</u>	<u>Amount</u>
00300	Bid Form	\$50,000 00

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Product List

1. Within five (5) working days prior to Bid Opening, submit to the Architect five (5) copies of complete lists of all products which are proposed substitutions and those proposed as "or equal:" to products specified, and in accordance with Contract documents.
2. For products specified only by reference standards, select any product meeting standards, by any manufacturer.
3. For products specified by naming several products or manufacturers, select any products and manufacturer named.

1.02 SUBSTITUTIONS

A. Requests for substitutions shall be made only in writing on the "SUBSTITUTIONS REQUEST" form attached with all blanks completed except those reserved for the Design Consultant. All substitution requests shall be made by the Contractor.

B. In connection with the use of any substitute item approved by the Architect it shall be the Contractor's responsibility to see that such items meet all space requirements, and that any alterations to connecting items necessitated by use of the alternate items are properly made, at no increase in cost to the District.

C. In making request for substitutions, Bidder/Contractor represents that:

1. He has investigated the proposed products or method and determined that it is equal or better in all respects to that specified and that it fully complies with all requirements of the Contract Documents.
2. He will meet all contract obligations with regards to this substitution;
3. He will coordinate installation of accepted substitutions into the work, making all such changes and any required schedule adjustments, at no additional cost to the District, as may be required for the work to be completed in all respects;
4. He waives all claims for additional costs and additional time related to substitutions which consequently become apparent. He also agrees to hold the District and Architect harmless from claims for extra costs and time incurred by other subcontractors and suppliers, or additional services which may have to be performed by the Architect, for changes or extra work that may, at some time or date, be determined to be necessary in order for the work to function in the manner intended in the Contract Documents.
5. He shall provide the same warranty and guarantee, and perform any work required in accordance therewith, for the substitution that is applicable to the specified item for which the substitution is requested;

SUBSTITUTIONS AND PRODUCT OPTIONS

6. Material shall be installed, handled, store, adjusted, tested, and operated in accordance with the manufacturer's recommendation and as specified in the Contract Documents.
7. In all cases, new materials shall be used unless this provision is waived by written notice from the Architect or unless otherwise specified in the Contract Documents; and
8. All material and workmanship shall in every respect be in accordance with and in conformity with approved modern and accepted industry practices, and shall conform to all applicable codes, regulations, laws, ordinances, and Contract Documents.

1.03 DESIGN PROFESSIONAL OPTIONS

- A. The Architect will be sole judge of acceptability of any proposed substitutions, and only approved substitutions that are accepted in writing may be used on contract work.
- B. Each request for substitution approval shall include:
 1. "Substitution Request" form with all required data completed, and accompanying specifications, etc., in triplicate.
 2. Identity of product for which substitution is requested; include specifications page and paragraph number.
 3. Identity of substitution; include complete product description, drawings, photographs, performance and test data, and any other information necessary for evaluation.
 4. Quality and technical specification comparison of proposed substitution with specified products.
 5. A description of changes required in other work because of substitution.
 6. Effect on construction progress schedule.
 7. Cost comparison of proposed substitution with specified product.
 8. Any required license fees or royalties.
 9. Availability of local maintenance service within a 50 mile air radius of the project.
 10. Source of replacement material or spare parts; if necessary, within a 50 mile air radius of the project.

1.04 SUBSTITUTION REQUESTS DURING BIDDING PERIOD

No request for substitution approval will be considered unless written request in triplicate has been submitted on the "Substitution Request" form included herein, and has been received by the Architect at least ten (10) working days prior to bid opening date. The Architect will issue addenda prior to bid opening listing all approved substitutions, should there be any approved.

1.05 SUBSTITUTION REQUESTS AFTER CONTRACT AWARD

- A. Approval will be granted only when:
 1. Specified product cannot be delivered without project delay, or
 2. Specified product has been discontinued, or,
 3. Specified product has been replaced by superior product, or

SUBSTITUTIONS AND PRODUCT OPTIONS

4. Specified product cannot be guaranteed as specified, or
 5. Specified product will not fit within designated space, or
 6. Substitution otherwise determined by the District to be in its best interest.
- B. The Contractor's request for substitution shall be accompanied by evidence documenting the reason for the substitution falls within one or more of the cases listed in A1 through A6 above.
- C. A Construction Change Document authorizing substitutions and revising Contract Sum where appropriate will be issued for approved substitutions.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

SUBSTITUTION REQUEST (in triplicate)

TO: _____

PROJECT: _____

SPECIFIED ITEM: _____

SECTION	PAGE	PARAGRAPH	DESCRIPTION
---------	------	-----------	-------------

The undersigned requests consideration for the following:

PROPOSED SUBSTITUTION: _____

STATE THE REASON(S) FOR PROPOSED SUBSTITUTION: (REASON MUST CONFORM TO ONE OR MORE CASES LISTED IN PARAGRAPH 1.05 A1 THROUGH 1.0A6.)

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request and applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents which the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitution does not affect dimensions shown on drawings:
- 2 The undersigned will pay for changes to the building design, including Architect's and engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule or specified warranty requirements.
4. Maintenance and service parts will be locally available (<50 miles from project) for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

For use by the Architect:

Signature: _____	<input type="checkbox"/> Accepted	<input type="checkbox"/> Accepted as noted
Firm: _____	<input type="checkbox"/> Not Accepted	<input type="checkbox"/> Received too late

Address: _____ By: _____

_____ Date: _____

Date: _____ Remarks: _____

Telephone: _____

Attachments: _____

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedure for requesting clarification of the intent of the Contract Documents.

1.02 RELATED SECTIONS

- A. Section 01 11 00: Summary of the Project
- B. Section 01 77 00: Project Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 PROCEDURE

- A. Prime Contractor shall prepare a Request for Information on the form provided and approved by the Architect and District. Prior to the submission of any RFI Prime Contractor is responsible for thoroughly reviewing all contract documents to insure that the answer to the question is not contained therein. Prime Contractor shall transmit the Request for Information to the Architect with any supporting information.
- B. Prime Contractor shall maintain a log of all RFI's that he submits to the Architect on a weekly basis at the weekly project meetings. RFI's shall be identified with a sequential number and be dated. Reference your company's name and the name of the subcontractor asking the question, if applicable, as well as the scope of work.
- C. RFI question and location shall be specific and clear. Indicate reference to construction documents sheet and detail number, as well as specification section.
- D. ARCHITECT response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.

- E. A Request for Information may be returned with a stamp or notation "Not Reviewed", if, in the opinion of ARCHITECT:
 - 1. The requested clarification is ambiguous or unclear to ARCHITECT.
 - 2. The requested clarification is equally available to the requesting party by researching and/or examining the Contract Documents.
 - 3. Prime Contractor has not reviewed the Request for Information prior to submittal to Architect.
- F. Allow a minimum of seven (7) calendar days for review and response time, after receipt by ARCHITECT. Architect will forward response to Contractor and Project Manager and DSA Inspector.

END OF SECTION



**Bonita Unified School District
Maintenance, Operations and Facilities Services**

Email to: Architecture 9 PLLLP
email address: mgelsinger@architecture9.com

Project Name: _____

Construction Request for Information (RFI)

To: _____ **RFI No.** _____

From: _____ **Date:** _____

Required by: _____ **Answered:** _____

REFERENCE:

Drawing(s) _____ **Specification(s)** _____ **Page(s)** _____

REQUEST:

RESPONSE:

RESOLUTION:

- ☐ No Change to Contract Document Required
- ☐ Changes Reflected in Addendum No.
- ☐ Schedule Impact - TBD

Issued By: _____

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedure for submission of a Schedule of Values for review and approval by the District Representative.

1.02 RELATED SECTIONS

- A. General Conditions.
- B. Construction Services Agreement
- C. Section 01 21 00: Allowances.
- D. Section 01 23 00: Alternates.
- E. Section 01 29 76: Progress Payment Procedures.
- F. Section 01 31 13: Project Coordination.
- G. Section 01 32 13: Construction Schedule.
- H. Section 01 32 29: Project Forms.
- I. Section 01 33 00: Submittal Procedures.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PREPARATION

- A. In accordance with the General Conditions, Contractor shall commence preparation of a Schedule of Values on the form included in Section 01 32 29.
- B. Contractor shall coordinate the preparation of a Schedule of Values with preparation of the Construction Schedule as set forth in Section 01 32 13.
- C. Round amounts to the nearest whole dollar; the total shall equal the Contract Amount.
- D. Provide a breakdown of the Contract Amount in enough detail acceptable to District Representative to facilitate continued evaluation of Application for Payment and progress reports. Coordinate with the Project Manual table of contents and Schedule of Values form under Section 01 32 29. Provide breakdown of all subcontract amounts.
- E. Provide separate line items for items in the Schedule of Values for total installed value of that part of the Work.
- F. Provide separate line item for labor and material when applicable.

SCHEDULE OF VALUES PROCEDURES

- G. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item except the amounts shown as separate line items as indicated under Schedule of Values form.
- H. Temporary facilities and other cost items that are not direct cost of actual work-in-place shall be shown as separate line items as indicated under Schedule of Values form.
- I. If at any time, District Representative determines, in its reasonable discretion, that the schedule of Values does not approximate the actual cost being incurred by Contractor to perform the Work, Contractor shall prepare, for District Representative approval, a revised Schedule of Values, which then shall be used as the basis for future progress payments. Without changing the Contract Amount, District Representative reserves the right to require Contractor:
 - 1. To increase or decrease amounts within the line items in the Schedule of Values; and,
 - 2. To conform the price breakdown to Owner accounting practice.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements relative to an Application for Payment.
 - 1. Coordinate the Schedule of Values and Application for Payment with, but not limited to, the Construction Schedule, submittal log, and list of Subcontractors.

1.02 RELATED SECTIONS

- A. General Conditions.
- B. Construction Services Agreement.
- C. Section 01 21 00: Allowances.
- D. Section 01 23 00: Alternates.
- E. Section 01 29 73: Schedule of Values Procedures.
- F. Section 01 32 13: Construction Schedule.
- G. Section 01 32 29: Project Forms.
- H. Section 01 77 00: Contract Closeout.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 APPLICATION FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as reviewed by Project Inspector, Architect, and District Representative. The following Applications for Payment involve additional requirements:
 - 1. The Initial Application for Payment
 - 2. The Final Application for Payment
- B. Payment Application Times: The period of Work covered by each Application for Payment is the payment date for each progress payment as specified in the General Conditions. The period covered by each Application for Payment is the previous month.
- C. Contractor shall submit a draft Application for Payment seven (7) days prior to the first of each month, to be reviewed by the Architect, District Representative, and Project Inspector.
- D. Application Preparation: Complete every entry on the form. Include execution by a person authorized to sign legal documents on behalf of Contractor.

- E. Transmittal: Submit a minimum of five (5) wet signature originals of each Application for Payment to the District Representative. All copies shall be complete, including releases and similar attachments.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to District Representative.
- F. *Initial Application for Payment:* Administrative actions and submittals, that must precede or coincide with submittal for the first Application for Payment include, but are not limited to, the following:
 - 1. Schedule of Values.
 - 2. Construction Schedule.
 - 3. Submittal Schedule.
 - 4. Emergency Contact List.
 - 5. OCIP Enrollment.
 - 6. Cal/OHSA Trenching Permit and Named Competent Person.
- G. *Applications for Payment:* Administrative actions and submittals that must precede or coincide with submittal of Progress Applications for Payment include, but are not limited to, the following:
 - 1. Certified Payroll (submitted directly to Labor Compliance Consultant in electronic format as specified by District Representative).
 - 2. Updated and current Project Record Drawings (as-built). Visual verification necessary only.
 - 3. Monthly Construction Schedule (updated, submitted and approved).
 - 4. Approved Schedule of Values.
 - 5. List of Subcontractors (Payments Summary).
 - 6. Waivers and Releases.
 - 7. Updated Submittal Schedule.
 - 8. Material invoices, evidence of equipment purchases, rentals, and other backup materials to support cost as requested by the District Representative.
- H. *Final Payment Application:* Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include, but are not limited to, the following:
 - 1. Project Inspector's sign-off and final approval of Project's DSA Form(s) 152.
 - 2. Contractor's submission of Contractor's Verified Report DSA Form 6-C.
 - 3. Completion of Contract Closeout requirements.
 - 4. Updated and Final As-Built drawings - in accordance with General Conditions.
 - 5. Completion and acceptance of final punch list items.
 - 6. Delivery of extra materials, products, and/or stock.
 - 7. Identification of unsettled claims.
 - 8. Proof that taxes, fees, and similar obligations are paid.

9. Operating and maintenance instruction manuals.
 10. Consent of surety to final payment.
 11. Waivers and releases.
 12. Warranties, guarantees and maintenance agreements.
 13. Training.
 14. Removal of temporary facilities and services.
 15. Removal of surplus materials, rubbish, and similar elements.
 16. Deductive items pursuant to the General Conditions.
 17. Completion and submission of all final change orders for the project.
- I. Any payments made to Contractor where criteria set forth above have not been met shall not constitute a waiver of said criteria by District Representative. Instead, such payment shall be construed as a good faith effort by District Representative to resolve differences so Contractor may pay its Subcontractors and suppliers and that Contractor agrees that failure to submit such items may constitute a breach of contract by Contractor and may subject Contractor to termination.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Coordination of Work of Contract.

1.02 RELATED REQUIREMENTS

- A. Section 00700 - General Conditions
- B. Section 01 25 13 - Substitutions and Product Options
- C. Section 01 31 19 - Project Meetings
- D. Section 01 33 00 - Shop Drawings, Product Data and Samples
- E. Section 01 77 00 - Contract Closeout

1.03 SUBMITTALS

- A. Coordination Drawings: Submit in accordance with Section 01 33 00, as specified herein.
- B. Work Plans: Submit as specified herein.

1.04 DESCRIPTION

- A. Coordinate scheduling, work activities, submittals, including deferred approvals, District separate contracts and work of the various sections of Specifications in accordance with the Master Project Schedule.
- B. Coordinate sequence of Work to accommodate District's separate contract and District's Occupancy as specified in Section 01 11 00.
- C. Set up control procedures so that the Master Project Schedule is adhered. Contractor's responsibility is to properly notify District's Project Manager of anticipated and actual time delays. Refer to General Conditions.
- D. Coordinate the Work and do not delegate responsibility for coordination to any Subcontractor.
- E. Anticipate the interrelationship of all Subcontractors, District separate contracts, and their relationship with the Work
- F. Resolve differences or disputes between Subcontractors concerning coordination, OR interference of Work between SECTIONS.

1.05 NOT USED

1.06 NOT USED

1.07 COORDINATION

- A. General: Work of the Contract includes coordination of the entire work of the Project, from beginning of construction activity through Project close-out and warranty periods.
- B. Mechanical/Electrical Requirements of General Work: Comply with applicable requirements of Division 23 Sections for Mechanical Provisions within units of General Work, and comply with applicable requirements of Division 26 for Electrical provisions within units of General Work.
- C. Service Connections: Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.
- D. Coordination: The Project will require close cooperation and coordination with the school site administration, the Architectural team, District Project Manager, and Contractor and Subcontractors. The Contractor shall consider all such coordination in his work inclusive, but not limited to, scheduling and proper sequencing of the Work with subcontractors and the District school site calendar and times that work cannot be, or occupied areas of the project school site that cannot be undertaken, during the entire project. In particular, the coordination of work before District's substantial completion of each project phase, and ensuring the site administration, the Architectural team, Inspector, and District Project Manager are fully advised of his activities to complete the Work in accordance with the Master Project Schedule.
- E. Coordination/Engineering Drawings:
 - 1. Contractor shall prepare and submit complete 1/4 " = 1'-0" coordination drawings, including plans, sections, details, etc., indicating the complete layout and all mechanical and electrical materials and equipment in all areas and within the ceiling spaces for new and existing conditions, including bottom of duct, pipe, conduit and elevations to allow District Architectural team to review with other Prime Trade Contractors' work that Contractor ensures will be coordinated properly.
 - 2. Mechanical, plumbing and electrical Prime Trade Contractors shall be responsible for providing all vertical sections through floors showing structural physical restraints, architectural restraints, plenum spaces and all other physical obstructions that may affect work.
 - 3. Electronic reproduction or photo reproduction of the project's Architectural, Structural, or MEP drawings will not be acceptable.
- F. Mechanical, plumbing and electrical Prime Trade Contractors shall prepare a 1/4" sleeving layout indicating size and location of sleeves. Provide copies to applicable trades and District Architectural team.

- G. Coordination/Engineering Drawings: These drawings are for the Contractor's and District's Representative's use during construction and shall not be construed as replacing any shop drawings, "as-built", or Record Drawings required elsewhere in these Contract Documents.
- H. Debris Removal and Material Access: An area will be designated for debris removal and material access as agreed by the Contractor and Architectural team at the school site.

1.08 EQUIPMENT COORDINATION

- A. Equipment Coordination: With respect to mechanical and electrical features of Contractor and/or District supplied equipment, complete data must be exchanged directly between the Contractor and those vendors and subcontractors involved as the progress of the Project requires. The person requesting the information shall advise when it will be required.
- B. The Prime Trade Contractor's for casework and equipment are expressly required to provide large scale layout drawings for casework and equipment showing the required rough-in locations of all services (dimensioned from building features) service characteristics, and locations of studs where the location is critical to mounting or otherwise installing equipment and casework. Furnish sizes and spacing required for Mechanical and Electrical cutouts, and a complete brochure of fittings, sinks, outlets, or other information to provide complete data on the items and accessories being furnished.
- C. In the event of incorrect, incomplete, delayed or improperly identified information, the entity causing the delay or error shall be responsible and pay for any modifications or replacements necessary to provide a correct, proper and new installation, including relocations required.

1.09 MEETINGS

- A. In addition to progress meetings specified in Section 01 31 19, attend coordination meetings and pre-installation conferences with requisite personnel to assure coordination of Work when scheduled with the Architectural, Engineer, Inspector, or Project Manager.

1.10 COORDINATION OF SUBMITTALS

- A. Schedule and coordinate submittals as required and as specified in Section 01 33 00.
- B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such materials and equipment.
- C. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other sections.

- D. Prime Trade Contractors shall submit the following drawings for review and approval:
 - 1. Fire Protection Drawings: Refer to Division 21.
 - 2. Fire Alarm System: Refer to Division 28.

1.11 COORDINATION OF SPACE

- A. Mechanical, plumbing and electrical Prime Trade Contractors shall coordinate use of Project space and sequence of installation of mechanical, and electrical work which is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- B. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- C. Off-Site Fabrication: Off-site fabrication is encouraged as much as possible and deliveries scheduled so materials and equipment can be installed immediately after delivery. The Contractors shall alert and advise material men of the need to hold deliveries until they are notified the materials are required on the site.

1.12 ELECTRICAL COORDINATION

- A. Provide supervision, communications, and coordination necessary to meet the requirements of electrical power connection as set forth by the designated power company.
- B. Provide reasonable and convenient staging and access areas near buildings to permit the respective Utility or its vendors or subcontractors, to install, modify or remove equipment and other components of the electrical power system furnished and installed by the designated power company.

1.13 COORDINATION OF CONTRACT CLOSEOUT

- A. Coordinate completion and cleanup of work of separate sections in preparation of District school site occupancy with approval of final cleanup by the Inspector and Project Manager.
- B. After District occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of District/school activities.
- C. Assemble and coordinate closeout submittals specified in Section 01 77 00.

1.14 NOT USED

1.15 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The Drawings show, if applicable, existing above and below grade structures, drainage lines, storm drains, sewers, water, gas, electrical, hot water, and other utilities which are known to the District.
- B. Locate all known existing installations before proceeding with construction operations which may cause damage to such installations. Existing installations shall be kept in service where possible and damage to them shall be repaired with no adjustment of Contract Sum. District archives as-built drawings, and Contractor shall be responsible to request to view any and all drawings for the areas that may be affected in the construction before the work begins.
- C. If any unforeseen structures or utilities are encountered, request District's Architectural Team to provide direction on how to proceed with the Work.
- D. If any structure or utility is damaged, take appropriate action to ensure the safety of persons and property and report the same to the District's Architectural Team, and begin immediate remediation of any safety-related condition.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION - NOT USED.

END OF SECTION

PART 1-GENERAL

1.01 SUMMARY

A. Work Included in this Section:

1. The Contractor's participation in preconstruction conference, application for payment, and guarantees, bonds, service and maintenance contracts review meetings.
2. The Contractor's administration and participation in project weekly progress meetings, pre-installation conferences and other meetings, as necessary.

1.02 PRE-CONSTRUCTION CONFERENCE

- A. Prior to commencement of Work, attend a pre-construction conference at time and a place selected by the School District to discuss procedures to be followed during the course of the work.
- B. The purpose of the conference is to introduce the District Project with the Architectural Team, the Inspector, the Construction/Project Managers, and the School's Representative key personnel, to review the contract provisions, project procedures, and other items pertaining to the Project; distribute documents including sample forms referenced in the Contract Documents; answer any questions related to construction contract administration; and establish schedule and procedures for future meetings. (This meeting is NOT to discuss any construction related specific specifications and drawings, nor address any requests for substitutions, etc.)
- C. Attending shall be:
1. District Representatives from Planning, Development and Facilities, Facility and Support Operations, and/or the Business Office.
 2. School Site Representatives, including the Construction Liaison
 3. The Project Inspector of Record
 4. The Architect of Record, and Architect's Construction Architect
 5. The Engineering Consultants
 6. The Contractor's Contracts Representative/Project Manager
 7. The Contractor's on Site Representative/Superintendent
 8. Representatives of the major subcontractors, as necessary

1.03 CONSTRUCTION PROGRESS MEETINGS

- A. During the course of construction, progress meetings will be held to discuss and resolve field problems.
- B. Meeting Schedule: At maximum one-week intervals or more often when required by the Architect/Inspector and/or Project Manager.
- C. Meeting Location: As designated by the District's Project Manager, in conjunction with the School Site liaison.

D. Attending shall be:

1. The District's Representative from Planning, Development and Facilities, Facility and Support Operations, and/or the Business Office
2. The Project Inspector of Record
3. The Architect's Construction Architect
4. The Engineering Consultants as appropriate to the Meeting Minute format, and as agreed upon by the Contractor and the Project Manager beforehand
5. The Contractor's On-Site Superintendent
6. The Contractor's Representative/Project Manager
7. Representatives of subcontractors/major suppliers as appropriate to a specific item of the Meeting Minute format, and at the time the specific item is reflected on the Meeting Minutes.
8. Others as appropriate to the Meeting Minute format and as agreed upon by the Contractor and the Project Manager beforehand.

NOTE: Representatives of the Contractor, subcontractors and suppliers attending Construction Progress Meetings shall be qualified and authorized to act on behalf of the entity each represents.

E. Suggested Agenda:

1. Review and approve minutes of previous meeting.
2. Review Construction Project Schedule and Daily Reports.
3. Review of work progress since previous meeting.
4. Review of upcoming work to take place on Two-week-Look-Ahead Schedule.
5. Discuss School Site concerns with regard to safety, paths of travel, and any upcoming events that may affect the work schedule.
6. Discuss field observations, problems, and decisions, affecting the work.
7. Review submittals schedule and status of submittals.
8. Review status of proposed substitutions, if any.
9. Review off-site fabrication and delivery schedules.
10. Review maintenance of progress schedule.
11. Agree on corrective measures to regain projected schedules, as necessary.
12. Review planned progress during succeeding work period.
13. Review coordination of projected progress.
14. Review maintenance of quality and work standards.
15. Review project safety of workers and practices.
16. Review any Inspector of Record Field Notices, or Deviations logs.
17. Other items relating to the Work.

F. The Architect, in coordination with the Project Manager, will make physical arrangements for project meetings, and the Architect shall prepare agenda, preside at meetings, record minutes, and distribute electronic draft copies of Minutes within three working days after Construction Project Meetings to the Project Manager, Inspector, conference participants and those affected by

the decisions made at the conference. The Architect will record in the minutes significant discussions and agreements and disagreements.

1.04 PRE-INSTALLATION CONFERENCES

- A. The Architect/Inspector may conduct a pre-installation conference at the site before each construction activity that the Architect/Inspector deems requires coordination with other construction or when required by the Construction documents.
- B. Attendance will be required of parties directly affecting, or affected by, or involved in the installation, and its coordination or integration with other materials and installations that have preceded or will follow the particular item of work or activity under consideration. Parties attending the conference shall be qualified and authorized to act on behalf of entity each represents.
- C. Conference Schedule: Schedule conference to assure a sufficient amount of time prior to the scheduled work or activity under consideration so that any concerns, problems or disagreements can be resolved without delaying the Project.
- D. The Architect, on conjunction with the Inspector, will make physical arrangements for conferences, prepare the agenda, preside at conferences, record minutes, and distribute copies within two working days after a conference to the Project Manager, Inspector, conference participants and those affected by the decisions made at the conference. The Architect will record in the progress meeting minutes significant discussions and agreements and disagreements as takes place in pre-installation conferences.
- E. Suggested Agenda: Review the progress of other construction activities and preparations for the particular activity under consideration, including requirements for:
 - 1. Contract Documents
 - 2. Options
 - 3. Related Change Orders
 - 4. Purchases
 - 5. Deliveries
 - 6. Shop Drawings, Product Data and quality control Samples
 - 7. Possible conflicts
 - 8. Compatibility problems
 - 9. Time Schedules
 - 10. Weather limitations
 - 11. Manufacturer's recommendations
 - 12. Compatibility of materials
 - 13. Acceptability of substrates
 - 14. Temporary facilities
 - 15. Space and access limitations
 - 16. Governing regulations

17. Safety
 18. Inspection and testing requirements
 19. Required performance results
 20. Recording requirements
 21. Protection
- F. Do not proceed with the work or activity if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

1.05 OTHER REQUIRED MEETINGS

- A. Project Closeout Meeting:
1. Thirty (30) days prior to the estimated substantial completion the project/phase, the Architect, Inspector, and Project will coordinate a meeting to review required construction maintenance manuals, guarantees, closeout submittals, bonds, and service contracts for materials and equipment; review and implement repair and replacement of defective items, and extend service and maintenance contracts, and schedule site training for all equipment.
 2. Attending shall be:
 - a. The District's Representative of Planning, Development and Facilities, Facility and Support Operations, and/or Business Office
 - b. The Project Inspector
 - c. The Construction/Project Manager
 - d. The Engineering Consultants, as appropriate
 - e. The Contractor's on-site Superintendent
 - f. Subcontractors, as appropriate
 - g. Suppliers, as appropriate
 - h. Others, as appropriate
- B. Guarantees, Bonds, and Service and Maintenance Review Meeting:
1. Eleven months following the date of Substantial Completion, the District Project Manager will convene a meeting for the purpose of reviewing the guarantees, bonds, and service and maintenance contracts for materials and equipment.
 2. Attending shall be:
 - a. The District's Representative
 - b. The Architect
 - c. The Engineering Consultants, as appropriate
 - d. The Contractor's Representative
 - e. Subcontractors and Suppliers, only as appropriate
 - f. Others as appropriate

1.06 PRIME TRADE CONTRACTOR MEETINGS

A. Construction Progress Meetings:

1. To be held at maximum one-week intervals or more often when required by the Architect/Inspector/Construction Project Manager.
2. Meeting Location: Contractor Jobsite trailer
3. All Prime Trade Contractors shall attend in order to review progress of work, and submit any questions or requests to the Contractor in order to ensure coordination of installations during the work schedule.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction Project Schedule procedures, preparation, submittal, updates, and revisions.

1.02 RELATED REQUIREMENTS

- A. General Conditions.
- B. Construction Services Agreement.
- C. Section 01 11 00: Summary of Work.
- D. Section 01 29 73: Schedule of Values Procedures.
- E. Section 01 29 76: Progress Payment Procedures.
- F. Section 01 31 13: Project Coordination.
- G. Section 01 33 00: Submittal Procedures.
- H. Section 01 45 23: Testing and Inspection.
- I. Section 01 50 00: Construction Facilities and Temporary Controls.
- J. Section 01 78 36: Warranty and Bonds.

1.03 PROCEDURES

- A. Within seven (7) calendar days after date of Notice to Proceed, Contractor shall submit to District Representative for review, a detailed Construction Schedule ("Preliminary Baseline Schedule") setting forth all requirements for complete execution of the Work.
- B. Within seven (7) calendar days after receipt of the District Representative's review comments, submit a final Construction Schedule acceptable to District Representative ("Approved Baseline Schedule").
- C. Include a written summary narrative sufficiently comprehensive to explain basis of Contractor's approach to work.
- D. If a Construction Project Schedule is considered by District Representative to not be in compliance with any requirement of the Contract, Contractor will be notified to review and revise the Construction Schedule and bring it into compliance. Failure of Contractor to submit a Construction Schedule in full compliance with the Contract Documents will result in withholding of progress payment in accordance with the General Conditions or Construction Services Agreement. The Construction Schedule is to be used in evaluating progress for payment approval.

- E. Subsequently with each Progress Payment Request, Contractor shall deliver to District Representative an updated Construction Schedule reflecting Work progress to the end of the Progress Payment Request period. Each such Construction Schedule shall indicate actual progress to date in execution of the Work, together with a projected schedule for completion of all the Work.

1.04 SCHEDULE SUBMITTAL PREPARATION GUIDELINES

- A. The Contract Work shall be scheduled and progress monitored using a Critical Path Method (CPM) network type scheduling system. Schedule shall be broken into sub-activities which shall, as a minimum, include major suppliers, all submittal approvals, all major trades, plumbing, mechanical, electrical, security, fire, and elevators and escalators. Scheduling system shall indicate all inter-relationships between trades and suppliers.
- B. Contractor shall utilize the Critical Path Method (CPM) in the development and maintenance of the construction schedule network.
- C. Duration and events indicated on schedule shall conform to phasing set forth in Section 01 12 16: Phasing of the Work (if applicable) and shall show any area or building within a particular phase. Schedule shall indicate any and all Contract "milestone events" and other milestones agreed to by District Representative, but no other manually-imposed dates will be accepted unless approved by District Representative.
- D. Construction Schedule shall represent a practical plan to complete the Work within the Contract time requirement.
 - 1. A schedule extending beyond Contract time or less than Contract time will not be acceptable.
 - 2. A schedule found unacceptable by District Representative shall be revised by Contractor and resubmitted.
- E. Construction schedule shall clearly indicate sequence of construction activities, grouped by applicable phase and sorted by areas, buildings, or facilities within phase, and shall specifically indicate:
 - 1. Start and completion of all Work items, their major components, and interim milestone completion dates, as determined by Contractor and District Representative.
 - 2. Activities for procurement, delivery, installation of equipment, materials, and other supplies, including:
 - a. Time for submittals, resubmittals, and reviews. Include decision dates for selection of finishes.
 - b. Time for manufactured products for the Work fabrication and delivery.
 - c. Interdependence of procurement and construction activities.
 - d. As applicable, dates for testing, balancing equipment, and final inspection.

- F. Schedule shall be in sufficient detail to assure adequate planning and execution of the Work.
 - 1. Each task activity shall range in duration from a 1 workday minimum to a fifteen (15) workday maximum and shall be total of actual days required for completion. The activity duration shall include consideration of weather impact on completion of that activity.
 - 2. Schedule shall be suitable, in judgment of District Representative, to allow monitoring and evaluation of progress in performance of the Work; it shall be calendar time-scaled.
 - 3. Activities shall include:
 - a. Description; what is to be accomplished and where.
 - b. Workday duration.
 - c. Scheduled activities shall indicate continuous flow, from left to right.
 - 4. Contractor shall setup up the schedule calendar to identify workdays per week and shifts per day worked, non-work days, weekends and holidays.
- G. Failure to include any element of Work required for performance of this Contract shall not excuse Contractor from completing Work required to comply with the Contract Documents, notwithstanding acceptance of Construction Schedule.
- H. Submittal of Construction Schedule shall be understood to be Contractor's confirmation that the schedule meets requirements of the Contract Documents, and that the Work will be executed in sequence indicated in schedule.
- I. All Construction Schedule submittals shall be transmitted with a Letter of Transmittal and shall include six (6) copies and one reproducible copy of a sufficient agreed upon size and the electronic file of the schedule in the format as required by District Representative.

1.05 REVIEWS, UPDATES, AND REVISIONS

- A. District Representative will review and return the initial submittal of Contractor's Construction Schedule, with summary comments. If revisions are required, Contractor shall resubmit Schedule within seven (7) calendar days following receipt of District Representative's comments.
- B. After Contractor and District Representative agree to a base line schedule, it will become the Project Construction Schedule. No changes to the Baseline Schedule will be allowed unless accepted by District Representative.
- C. Contractor shall analyze and update the Project Construction Schedule:
 - 1. As part of monthly payment application, Contractor shall submit to and participate with District Representative in a schedule review to include:
 - a. Actual start dates for Work items started during report period.
 - b. The percent complete on activities that have actual start dates.

- c. Actual completion dates for Work items completed during report period.
 - d. Estimated remaining duration for Work items in progress, which will not exceed original duration for activity.
 - e. Estimated start dates for Work items scheduled to start during month following report period, if applicable.
 - f. Changes in duration of Work items.
 - 2. In case of a change to Contractor's planned sequence of Work, Contractor shall include a narrative report with updated progress schedule which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors, and any proposed revisions for a recovery plan.
 - 3. Change Orders affecting the scheduled completion date shall be clearly identified as separate and new activities integrated into the schedule at the appropriate time and in the appropriate sequence as reviewed and approved by District Representative.
 - 4. The Project Construction Schedule Review will not relieve Contractor of responsibility for accomplishing all Work in accordance with the Contract Documents.
- D. Updates: Contractor shall submit to District Representative, with each payment application, an up-to-date Project Construction Schedule. Contractor submission of the Monthly Updated Project Construction Schedule is a condition precedent to District Representative's approval of Progress Payments. The Update Project Construction Schedule shall include the following:
- 1. Work Item Report: Detailing Work items and dependencies as indicated on the Schedule.
 - 2. Actual Start and End Dates of Activities under construction
 - 3. Separate listing of activities completed during reporting period.
 - 4. Separate listing of activities which are currently in progress, indicating their remaining duration and percentages completed.
 - 5. Separate listing of activities which are causing delay in Work progress.
 - 6. Narrative report to define problem areas, anticipated delays, and impact on the Project Construction Schedule. Contractor shall report corrective action taken, or proposed, and its effect, including effect of changes on schedules of separate contractors.
 - 7. Resolution of conflict between actual Work progress and schedule logic: when out-of-sequence activities develop in the Schedule because of actual construction progress, Contractor shall submit a revised schedule to conform to current job sequence and direction.
- E. If, according to current updated Project Construction Schedule, District Representative determines Contractor is behind schedule or any interim milestone completion dates will not be met, considering all time extensions to which Contractor is entitled, Contractor shall submit a revised recovery

schedule, showing a workable plan and a narrative description to complete the project on time. Refer to General Conditions.

- F. Scheduling of change or extra Work orders is responsibility of Contractor.
 - 1. Contractor shall revise the Project Construction Schedule to incorporate all activities involved in completing change orders or extra Work orders and submit it to District Representative for review.
- G. If District Representative finds Contractor is entitled to extension of any completion date, under provisions of the Contract, District Representative's determination of total number of days of extension will be based upon an analysis of the current Project Construction Schedule, and upon data relevant to the extension.
- H. Contractor acknowledges and agrees that delays to non-critical activities will not be considered a basis for a time extension unless activities become critical. Non-critical activities are those activities which, when delayed, do not affect an interim or Substantial Completion date.
- I. Contractor shall allow Float time for inclement weather, Government Delay, and Project Float in the Baseline Schedule in accordance with the General Conditions. The Inclement Weather Float and the Government Delay Float shall each be identified as a Critical Activity in the Baseline Schedule. No other activities may be concurrent with them. When rainfall at the Project site impacts Critical Path activities, Contractor may provide District Representative with a written request for a rain impact day describing the inclement weather delay on the Critical path activities. The inclement weather delay must be clearly indicated by a seventy-five percent (75%) decrease in the normal field labor workforce hours on Critical Path activities on the day in question as indicated by Contractor's Daily reports from the day in question and the scheduled Work days prior to the day in question. Upon District Representative's independent confirmation of the amount of rainfall and impact, District Representative will authorize Contractor to reduce the duration of the Rain Day Impact Allowance by one day. Rainfall on non-scheduled workdays shall not be granted as rain impact days. If the effects of rain from a non-scheduled Work day carry forward to a scheduled work day and impacts the Critical Path as noted above, then the scheduled work day will be considered impacted by rain.

1.06 CONTRACTOR'S RESPONSIBILITY

- A. Nothing in these requirements shall be deemed to be an usurpation of Contractor's authority and responsibility to plan and schedule Work as Contractor sees fit, subject to all other requirements of Contract Documents.
- B. Contractor shall provide at all times sufficient competent labor, materials, and equipment to properly carry on Work and to insure completion of each part in accordance with Construction Schedule and within time allowed in the Contract.

CONSTRUCTION PROJECT SCHEDULE

- C. Contractor shall be responsible for ensuring that all submittals to the District Representative are accurate and consistent. Damage, including extra time and cost, caused by inaccuracies from Contractor will be compensated by Contractor.

1.07 SUSPENSION OF PAYMENTS

- A. Initial Submittal: If Contractor fails to comply with the specified requirements, District Representative reserves the right to engage an independent scheduling consultant to fulfill these requirements. Upon additional notice to Contractor, District Representative shall retain against Contractor all incurred costs for additional services.
- B. Update Submittals: District Representative has the right to withhold progress payments if Contractor fails to update and submit the Project Construction Schedule and reports as required by District Representative.

1.08 RECORD COPY

- A. Prior to the Contract Completion, Contractor shall submit the Project Construction Schedule showing the as-built sequence. The as-built schedule shall have all activities with actual start and end dates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Coordinate both the listing and timing of reports and other activities required by provisions of this and other Sections, so as to provide consistency and logical coordination between the reports. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Make monthly distribution of the progress schedule and update to all parties involved in the work including the Architect, Inspector, and Project Manager, along with the Request/Application for Payment. In particular provide definition and coordination of the progress schedule, with phases, changes, schedule of values, funding sources and progress reports.
- B. Project (CPM) Schedule:
 - 1. Secure critical time commitments for performing major elements of the work of for the entire duration of the Contract. Within 30 days after the Notice to Proceed, submit a comprehensive Critical Path Method (CPM) chart progress schedule indicating, by stage-coded symbols, milestones for each major specification section, category, or tunit of work to be performed; include minor elements of work, which are, nevertheless, involved in overall sequencing of the work. Include dates for completion of each phase of work. Arrange schedule to show graphically the major sequences of work necessary for the completion of related elements of work. Arrange the schedule to allow for the Architect's review of submittals as well as procedure for certification of substantial completion. Prepare and maintain the schedule on a sheet of sufficient width (or a series of sheets) to show the required data clearly for the entire construction time. Prepare the schedule on sheets of stable transparency, or other reproducible material, to permit reproduction for the required distribution.
 - 2. Utilize MS Project or similar project management software.
 - 3. Provide a minimum 3 days prior to Project Job Meeting to Architect, IOR and District Representative.
- C. Daily Reports: Prepare a daily report, recording the following information concerning events at the site; make available to the Inspector for on-site review and submit duplicate copies to the Inspector and Architect upon request:
 - 1. List of Contractor personnel at the site
 - 2. List of Subcontractors at the site
 - 3. Accurate Count of personnel at the site by trade, and Subcontractor
 - 4. Material and Equipment Deliveries
 - 5. High/low temperatures, and general weather conditions.
 - 6. Accidents or injuries.
 - 7. Meetings and significant decisions.
 - 8. Unusual events.
 - 9. Stoppages, delays, shortages, losses.
 - 10. Emergency procedures, field orders.

11. Orders/requests by governing authorities, signed.
 12. Services connected, disconnected.
 13. Equipment or system tests and start-ups.
 14. Partial completions, occupancies.
 15. Substantial completion requested.
 16. Substantial completion authorized.
 17. Requests for Inspections
- D. Progress Reports: Contractor shall submit "Verified Reports", on prescribed form, of construction per requirements of Title 24, CCR.
- E. Two-Week-Look-Ahead Schedule:
1. Contractor to provide a Two-Week-Look-Ahead Schedule at every Project Job Meeting.
 2. Schedule to include but not limited to the following:
 - a. All work that is projected to occur in the two upcoming weeks.
 - b. Inspections needed to occur.
 - c. Submittal required from Architect.
 - d. District-require items.
 - e. City and/or DSA needed approvals.
 - f. Any site construction that may affect school activities.
 - g. School events that may affect construction activities.
 3. Provide a minimum 3 days prior to Project Job Meeting to Architect, IOR and District Representative.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Procedures.
- B. Contract.
- C. Construction Progress Schedules and Contract Breakdown.
- D. Shop Drawings, Product Data, and Samples.
- E. Manufacturers' Instructions and Certificates.

1.02 RELATED REQUIREMENTS

Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this Work.

1.03 PROCEDURES

- A. All Submittals must be approved by Architect no later than **fourteen (14)** calendar days after the issuance of the **Notice to Proceed**.
- B. Prepare a listing showing principal work-related submittals and their initial submittal dates as required for coordination of the Work. Organize the listing by the related specification number sequence. Submit the listing within seven (7) days after the award of the Contract.
- C. Submit Shop Drawings and product data in accordance with General Conditions. Submittals shall be approved and on file at the Site(s) prior to the initial use of the material, product, plan or system on Site.
- D. Deliver submittals to Architect at address listed on cover of Project Manual.
- E. Identify Project, Contractor, subcontractor, and major supplier; identify pertinent Drawing sheet and detail number, Specifications Section number, as appropriate. Identify deviations from Contract Documents. Provide space for Contractor and Architect review stamps.
- F. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.
- G. The Contractor shall approve submissions prior to submitting for the Architect's review. By approving and submitting Shop Drawings, the Contractor represents that he has determined and verified materials, field measurements, and field construction related criteria, or will do so, and that he has checked and coordinated the information contained with such submittals with the requirements of the Work and the Contract Documents.

- H. After Architect's review of submittal, revise and resubmit as required, identifying changes made since previous submittal.
- I. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.04 CONTRACT

- A. Furnish simultaneously three (3) executed copies of:
 - 1. Agreement.
 - 2. Performance Bond.
 - 3. Payment Bond.
 - 4. Certificate - Worker's Compensation.
 - 5. Certificates showing Proof of Carriage of Insurance required by General Conditions.

1.05 PROJECT FORMS

- A. Submit to District and Architect the following Project Forms for review and approval:
 - 1. Pay Application
 - 2. Schedule of Values
 - 3. Change Order Form
 - 4. Request for Information
 - 5. Critical Path Schedule
 - 6. 2 - Week Look Ahead Schedule
 - 7. Daily Report

1.06 CONSTRUCTION PROGRESS SCHEDULES AND CONTRACT BREAKDOWN

- A. Construction Schedules:
 - 1. Submit horizontal bar chart with separate bar for each major trade or operation, identifying first workday of each week.
 - 2. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Show projected percentages of completion for each item of Work as of each Application for Progress Payment.
 - 3. Show submittal dates required for shop drawings, product data, and samples and product delivery dates, including those furnished by Owner.
- B. Furnish Contract Breakdown per General Conditions:
 - 1. Format: Table of Contents of this Project Manual. Identify each item with number and title of the major Specifications Sections.

1.07 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. General: Refer to General Conditions for basic procedures including Contractor's review of Shop Drawings, product data and samples before submittal to Architect. Submittals without a Contractor's stamp of approval will be returned by the Architect with no action taken.

- B. Coordination: Coordinate the submittals so that one submittal will not be delayed by the Architect's/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.
- C. Shop Drawings:
 - 1. Modify General Conditions requirements to conform to the following.
 - 2. Conform to this Article, except where individual Specifications Section requirements are more stringent.
 - 3. Submit in the form of one reproducible and three (3) opaque reproductions. After review, reproduce and distribute in accordance with requirements in Article on Procedures, above.
- D. Product Data:
 - 1. Product data includes standard printed information on manufactured products that has not been specifically prepared for this project, including but not limited to the following items:
 - a. Manufacturer's product specifications and installation instructions.
 - b. Standard color charts.
 - c. Catalog cuts.
 - d. Standard product operating and maintenance manuals.
 - e. ICC reports, if applicable.
 - 2. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to the Work.
 - 3. Submit the number of copies, which Contractor requires, plus two copies, which will be retained by Architect.
- E. Samples:
 - 1. Include identification on each sample to indicate use, project and building name, manufacturer's name supplier or subcontractor name, and submittal date.
 - 2. Submit full range of manufacturers' standard colors, textures, and patterns for Architect selection. Submit samples for selection of finishes within seven (7) days after date of Contract.
 - 3. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.
 - 4. Submit the number specified in respective Specifications section; one will be retained by Architect. Reviewed samples, which may be used in the Work, are indicated in the Specifications Section.
 - 5. Color Schedule Preparation:
 - a. Promptly submit to Architect samples for materials requiring color selections.

- 1) Submit two (2) sets of samples for materials requiring color selection only.
 - 2) Submit four (4) sets of samples for materials requiring color, pattern, and texture selection.
 - 3) Additional quantities may be requested by Architect.
- b. After such samples are received, Architect will select colors and issue a comprehensive Color Schedule. Color selections will not be made until all samples, indicating color, pattern and texture have been received.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.02 REQUIREMENTS OF REGULATORY AGENCIES:

All pertaining statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction of the Work are hereby incorporated into these Contract Documents the same as if repeated in full herein and such are intended where any reference is made in either the singular or plural to Code or Building Code unless otherwise specified including, without limitation, those in the list below. Contractor shall make available at the site such copies of the listed documents applicable to the Work as the Architect or Owner may request including mentioned portions of the California Administrative Code (CAC).

- A. With respect to the Division of the State of Architect and State Fire Marshal, most-recent adopted Edition.
- B. California Building Standards Code (CBSC), Title 19 CBSC (Public Safety, State Fire Marshal Regulations) Latest Edition and Amendments.
- C. Building Standards Administrative Code, Part 1, Title 24 CBSC, Latest Edition.
- D. California Building Code (CBC), Part 2, Title 24, CBSC (International Building Code with California Amendments) Latest Editions.
- E. California Electrical Code (CEC), Part 3, Title 24, CBSC (National Electrical Code and California Amendments) Latest Editions.
- F. California Mechanical Code (CMC), Part 4, Title 24 CBSC (Uniform Mechanical Code and California Amendments) Latest Editions.
- G. California Plumbing Code (CPC), Part 5, Title 24 CBSC (Uniform Plumbing Code and California Amendments) Latest Editions.
- H. California Energy Code, Part 6, Title 24 CBSC, Latest Edition.
- I. California Fire Code, Part 9, Title 24 C.C.R. (International Fire Code and California Amendments) Latest Editions.
- J. California Green Building Standards (CALGREEN), Part 11, Title 24 CBSC, Latest Edition.
- K. California Referenced Standards, Part 12, Title 24, C.C.R., Latest Edition.
- L. State and Local Public Health Codes, Latest Editions and Amendments.

- M. Other statutes, ordinances, laws, regulations, rules, orders, and codes specified in other Sections of the Specifications or bearing on the Work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All inspection and testing required to establish compliance with Contract Documents and Title 24 CCR requirements, except as may be otherwise specified, shall be made by an independent professional testing agency or firm selected and paid by the Owner/District (or as otherwise noted). All work prior to the call out of the inspection services shall be approved by the Inspector of Record as ready for the inspection services.
- B. The cost of most services for testing and inspection in compliance with Contract Documents requirements will be paid by the Owner. If initial tests indicate non-compliance with Contract Document requirements, any non-compliance testing shall be performed by the same inspection service and back charged to the General Contractor. Schedule portions of the work requiring testing and inspection services so that the time of the agency on the work is as continuous and brief as possible. Should an inspection service be called out without proper pre-inspection and approval by the Inspector of Record, and the Contractor causes the inspection service to be on site for longer than the minimum call-out costs, or the Contractor causes the inspection service to make a return call to the site for the same inspection, the additional costs shall be back-charged to the Contractor.
- C. Concrete Coring Procedures: Prior to the start of any concrete coring, the Contractor shall submit a detailed coring plan, indicating the size and precise locations of the cores, for approval by the Architectural Team/Structural Engineer. Proposed coring locations must be marked in the field and verified by the District IOR. The project Architectural Team/Structural Engineer may also request to perform a field inspection if deemed necessary. The Contractor SHALL arrange for and bear the costs of all Pachometer tests of the areas to be cored.

1.02 CONTRACTOR'S RESPONSIBILITY

- A. Coordination: The Contractor shall initiate and coordinate testing and inspections required by the Contract Documents and public authorities having jurisdiction over the work through the Architect and/or Inspector of Record.
- B. Access: Furnish free and safe access to the various parts of the work and assist testing and inspection personnel in the performance of their duties at no additional cost to the Owner.
- C. Data: Furnish records, drawings, certificates, and similar data as may be required by the testing and inspection personnel to assure compliance with the Contract Documents.
- D. Notification: Provide the Architect and/or Inspector of Record and Testing Laboratory with at least 72 hours advance notification of required testing.

- E. Defective work: Remove and replace any work found defective or not complying with Contract Document requirements at no additional costs to the Owner (shall apply to 1, 2, and 3 immediately below). Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance and as approved by the District IOR.
 - 1. Concrete: If test cylinders for concrete fail to meet design stresses, make core and load tests as may be directed by the Design Professional; make core tests in accordance with an ASTM C42 or most recent update and load tests in accordance with ACI 318 or most recent update. Correct all deficiencies found in forms, reinforcing steel and embedded items.
 - 2. Structural Steel: Should any weld or structural connection fail to meet design stresses, provide sonic or x-ray examination of all structural connections as directed by the Architect/engineer. Replace or repair all defective connections as directed.
 - 3. Roofing membrane work: Should roofing membrane, including associated flashing and jointing, indicate non-compliance with Contract Document requirements, provide corrective work as directed.
- F. Lead Levels in Water: The domestic water piping system shall be protected during tie-ins or other construction activities that have the potential to elevate the lead levels in the water. The water in the domestic water piping shall be tested prior to the start of work and the lead levels documented. Testing shall also be performed upon the completion of all work and any lead contamination, above the levels documented prior to the start of work shall be the Contractors responsibility to reduce the levels to the pre-project levels.
 - 1. If the domestic water system is contaminated as a result of construction activities, the Contractor shall decontaminate the domestic water system. The procedures shall comply with applicable regulatory requirements.

1.03 TESTING LABORATORY RESPONSIBILITY

- A. Taking Specimens: Specimens and samples for testing, unless otherwise provided in the Contract Documents, will be taken by the testing personnel. Sampling equipment and personnel will be provided by the testing laboratory. Deliveries of specimens and samples of the testing laboratory will be performed by the testing laboratory.
 - 1. When the testing laboratory is ready to test, but is prevented from testing or taking specimens due to incompleteness of the work or other scheduling lapses, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

- B. Test Reports: Reports shall include all tests made, regardless of whether such tests indicate that material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Reports shall state which requirements with which the material or materials were sampled and tested. Test reports shall show the indicated or specified design strength(s) and state definitely whether or not the materials tested comply with the specification requirements.

Report distribution shall be made as follows:

Owner's Rep	1 copy, and 1 electronic pdf
Architect	1 copy, and 1 electronic pdf
Structural Engineer	1 copy
Contractor	2 copies
DSA	2 copies (or as req'd by DSA)

- C. The inspection agency shall cooperate with the Contractor so as to cause no delay in the progress of the work, but shall be directly responsible to the Owner for his actions. The inspection agency shall have no authority to direct the work of the Contractor.
- D. Submittals: Promptly submit copies of reports of inspections and tests, mill analysis, concrete mix designs and certifications per applicable sections of the specification.
1. Comply with requirements of each technical specification section and DSA requirements.
 2. Reports shall include all tests made, regardless of whether such test indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were samples and tested in accordance with the requirements of the Title 24 and with the approved specifications. Test reports shall show the specified design strength. They shall also state definitely whether or not the material or materials tested comply with requirements.
 3. Testing Agency is not authorized to:
 - a. Release, revoke, alter, or enlarge on, requirements of Contract Documents.
 - b. Perform any duties of the Contractor.

1.04 REQUIRED INSPECTIONS & TESTS

The following are inspection services and tests required of but not limited to the Inspection and Testing Agency.

- A. Metal work inspection & tests: Perform the following services as required to assure compliance with requirements of Division 5 of the technical specifications.
1. Structural steel fabrication: Furnish visual inspection of all shop fabricated parts including joists and joist girders. This inspection may be done in shop

or in field after delivery. Furnish inspection and testing of shop welds in accordance with requirements for welding specification hereinafter. Check shapes, sizes, classes, and types of steel. Verify conformance of structural steel materials with requirements of Contract Documents. Test end welded studs, replace studs damaged by test.

2. Structural steel field inspection & tests: Check location and fit of all anchorage and inserts. Verify adjustments to fit inaccuracies. Furnish visual inspection of erection of all structural steel components of the work. Furnish inspection and testing of all field welding in accordance with requirements for welding in accordance with requirements for bolting specific hereinafter. Inspect and test all bolted connections in accordance with requirements for welding specified hereinafter. Inspect for compliance with AISC Code of Standard Practice with requirements of the Contract Documents; other duties and responsibilities as may be noted on drawing.
 3. Welding requirements: Furnish visual inspection of all field fillet welding. Furnish inspection of fillet welds in accordance with requirements of AWS D1.1 (Rev. I): allow for inspection of a minimum of 15% of fillet welds by magnetic particle or dry penetrant methods
 4. Bolting requirements: Furnish visual inspection of structural joints where ASTM A325-10e1 bolts are used; verify the applicable requirements of AISC specifications are met.
- B. Thermal and moisture protection work testing & inspection: Perform services as required to assure compliance with requirements of Division 7 of the technical specification.
- C. Roofing: Check deck surfaces prior to application of roofing materials and verify that substrate is in satisfactory conditions to receive roofing. Furnish continuous inspection during application of roofing, including application of vapor barriers, insulation and roofing. Inspect all sheet metal flashings, counterflashing and reglets for satisfactory and waterproof installation.
- D. Wood: Check framing lumber moisture content prior to framing.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Contractor shall ensure that all employees, visitors, subcontractors, subcontractor employees, and suppliers, while on the worksite, comply with the requirements of OSHA, these requirements, and the safety precautions contained in the several Specification Sections.
- B. The Contractor shall promptly and fully comply with and execute, without separate charge thereof to the District, shall enforce compliance with the provisions of the Williams Steiger Occupational Safety Health Act of 1970 (Public Law 91-596 with most recent updates and amendments) with particular attention paid, but not limited to, Title 29-Labor, Chapter XVII - Occupational Safety and Health Administration, Department of Labor Part 1926 - (Safety and Health Regulations for Construction), and part 1910 - (Occupational Safety and Health Standards), as printed, respectively, in the June 24, 1974, and June 27, 1974, Federal Register, and latest adopted amendments and changes thereto.

1.02 PRELIMINARY WORK

- A. Prior to the start of and during the course of the work (above and below ground) the Contractor shall make a thorough survey of the entire worksite to determine all potential hazards. Workmen shall be made aware of those hazards and shall be instructed in procedures and the use of equipment for their protection. The Contractor shall verify the location and condition ("live" or "dead") of all utilities on and near the worksite and take precautions to protect his employees, subcontractors, material men, the general public, and the property.

1.03 IMMINENT DANGER

- A. The District may stop those operations which create an imminent danger to employees (as defined by OSHA), to the public and to property.
- B. The Contractor shall be wholly responsible for any accident (including death) occurring at any time during the progress of the work and until the final acceptance of the work by the District which may happen to any of his employees/workmen or those of any Subcontractor employed on the building, the property, or for any damage or injuries (including death) which his work and operations may cause to the work being constructed, or to existing buildings, or to any tenants and occupants of the property, or of the adjoining properties, or to the public, or to any public or private property.

1.04 COOPERATION:

- A. The Contractor shall cooperate with the safety representatives of the District, District's Insurance Managers and the District's Insurance Company in any and all inquiries before, during, and after the project.

1.05 SAFETY RESPONSIBILITIES:

- A. Contractor's Superintendent shall:
 - 1. Ensure compliance with these requirements, OSHA requirements and other safety requirements, and provide and implement an Injury and Illness Prevention Program (IIPP) at the project site.
 - 2. Provide, supervise, and support a Contractor's Project Safety Supervisor and enable him/her to execute effectively their duties and responsibilities.
 - 3. Authorize immediate action to correct substandard safety conditions.
 - 4. Review and act to ensure compliance with safety procedures with his supervisors, subcontractors and suppliers.
 - 5. Take an active part in all supervisory safety meetings.
 - 6. Cooperate with safety representatives of the District, District Insurance Managers, and the District's insurance company.
 - 7. Ensure that all security and temporary fencing has been secured to prevent any movement or causal action that could contribute to any hazardous or unsafe condition, or which ultimately may cause harm.
- B. Contractor's Project Safety Supervisor shall:
 - 1. Make thorough daily safety inspections of the worksite and immediately act to eliminate unsafe acts and unsafe conditions, and record all suggestions made and corrective action taken.
 - 2. Investigate worksite accidents and recommend immediate corrective action.
 - 3. Weekly safety meetings shall be conducted and documented in the daily report of activity by the contractor. Weekly safety meeting notes shall be recorded, noting the contractors and trades on site, the topics that were discussed and the attendance by contractor name, workmen name and trade, in attendance on the project that day.
 - 4. Review safety meetings reports submitted by job foremen and act to ensure that meaningful weekly safety meetings are held by the job foremen.
 - 5. Attend foremen "tool box" safety meetings and evaluate effectiveness.
 - 6. Assist in the preparation of accident investigation and reporting procedures.
 - 7. Implement training programs for supervisors and employees as they apply to their specific responsibilities.
 - 8. Be responsible for the control, availability, and use of safety equipment, including employee personal protective equipment.
 - 9. Coordinate his activities with those of the District's Inspector and/or Project Manager, and immediately implement their safety suggestions.
 - 10. Coordinate public relations aspects of the Contractor's safety program.
- C. Contractor's Job Foreman shall:
 - 1. Instruct workmen regarding safe work practices and work methods at the time workmen are given work assignments.

2. Furnish and enforce the use of personal protective equipment and suitable tools that are equipped with all the manufacturer's supplied safety features, and have not been altered in any way, for the job.
 3. Continuously check to see that no unsafe practices and conditions are allowed to exist on this portion of the work.
 4. Set a good example for his personnel.
 5. Make a complete investigation of accidents to determine facts necessary to take corrective action to prevent a recurrence, and record the facts in a written report to accompany the daily report as set forth in the IIPP.
 6. Promptly supply information for, or complete, an Accident Report and Investigation Form as directed by the Contractor Safety Supervisor and Contractor's Superintendent/Project Manager.
 7. Hold weekly "tool box" safety meetings with his personnel to:
 - a. Discuss observed unsafe work practices and unsafe conditions.
 - b. Review the accident experience of his crew and discuss correction of the accident causes.
 - c. Encourage safety suggestions from his crew and report those suggestions to the Safety Supervisor.
 8. Ensure that first aid is promptly administered to an injured employee.
 9. Report immediately, to Contractor's Superintendent/Project Manager, or Safety Supervisor, any injuries, or violations of job safety and security.
- D. Subcontractor's Job Superintendent shall:
1. Plan and execute his work so as to comply with the Construction Safety Program.
 2. Furnish and enforce the use of personal protective equipment.
 3. Attend supervisory personnel safety meetings schedule by the Contractor.
 4. Schedule and attend weekly "tool box" safety meetings to be held by job foremen for all employees.
 5. Report to the Contractor's Project Safety Supervisor or Contractor's Superintendent all observed unsafe conditions, unsafe practices, and violations of job security.
 6. Cooperate with the District's safety representative.

1.06 CONTRACTOR'S SAFETY SUPERVISOR:

- A. Contractor shall designate a full-time employee as Contractor Project Safety Supervisor.
- B. Qualifications must be approved by the District. Supervisor shall:
 1. Have heavy construction experience of not less than three (3) years, one of which must have been in a supervisory capacity.
 2. Be familiar with job safety laws and regulations.
 3. Have accident prevention experience.

- C. Duties: Project Safety Supervisor shall conduct regular inspections of the work, shall ensure compliance with job safety requirements, shall maintain the Contractor's safety program IIPP on site and available for review by the District's Inspector and/or Project Manager and shall enforce safe practices, use of safety equipment and personal protective equipment, and other such activities as may be required by OSHA, the safety requirements, and the safety precautions contained in the several Specification Sections.
- D. If the Project Safety Supervisor is not effective in executing the duties assigned him, the District may request, in writing, that the Contractor furnish a new Project Safety Supervisor.
- E. If the Contractor desires to replace the Project Safety Supervisor, he shall so notify the District and the District's Insurance Managers, in writing and shall submit the name, experience and qualifications of the proposed Project Safety Supervisor for approval.

1.07 VEHICLE ESCORT

- A. provide a vehicle, construction equipment and/or any motorized equipment with a forward and rear escort at all times when children are on-site. Escort shall be continuous from parking lot to point-of-construction.

1.08 REQUEST FOR VARIANCES

- A. Request for variances to deviate from OSHA requirements must follow the current established procedures by that Agency.

1.09 FAILURE TO COMPLY

- A. If the Contractor fails to comply with the requirements of OSHA, the safety requirements, and the safety precautions contained in the Specifications Sections, or to provide an on-site IIPP, the District may modify or stop the work and portions thereof, until such failure is remedied. Willful and repeated failure to comply could result in the shutdown of the work, and portions thereof. No part of the time lost due to any such modification of operations or stop orders shall be made the subject of a claim for extension of time or for increased costs of damage by the Contractor.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The District will provide a Project Inspector, or Inspector of Record (IOR) for this project.
- B. Contractor shall submit an Inspection Request Form to the Project Inspector (IOR) at least 48 hours prior to the time the inspection is needed, and on the form required. Contractor shall not cover any work requiring inspection until the Project Inspector (IOR) has inspected and approved the subject work.
- C. For work not in conformance with the Contract Documents, the Project Inspector (IOR) shall submit to the Contractor a Deviation/Non-conforming Notice.
- D. Contractor to provide continuous observation of work any time an employee, sub-contractor, vendor, delivery service, consultant is on-site.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Temporary utilities, construction facilities and project sign(s) which are to be provided and maintained by the Contractor.
- B. Dust and noise control.
- C. General temporary items including staging area for material delivery and safety and security lighting.

1.02 TEMPORARY UTILITIES:

- A. Water:
 - 1. Arrange for water with District Construction/Project Manager and install all necessary water lines, connections and metering devices for project, and upon completion of the work, remove such temporary facilities.
 - 2. District will pay for all water needed for construction. Water conservation techniques are to be observed by all workmen. Contractor is to provide and maintain all water conveyance equipment, hoses, nozzles, hose bib connections, free from leaks, and equip all hoses with positive closing, hand-squeeze-type operating nozzles - - it is not permitted to operate a hose without a positive closing nozzle.
 - 3. Provide suitable drainage system, subject to the approval of the Architect/Engineer and as indicated on the approved SWPPP, to carry construction waste water from site to an approved disposal location.
- B. Electricity:
 - 1. District will pay for all electricity needed for construction. Contractor is to arrange for and install all necessary temporary poles, wiring and metering devices and, upon completion of the work, remove such temporary facilities. Electricity conservation best management practices shall be observed by all workmen, and any unnecessary lighting, or electrical discharge shall be turned off at the end of each shift. Only safety lighting is allowed after each shift is concluded.
 - 2. Furnish and install area distribution boxes, so located that the individual trades may use 100 foot maximum length extension cords to obtain adequate power and work task lighting, at points where required for the work, for inspection and for safety.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

3. Provide all electricity needed for construction including connections for construction equipment requiring power.
 4. Lighting in the construction work area shall be sufficient to allow safe travel for workmen and the Architectural team during normal working hours of the project, and shall be shut down to conserve energy after normal construction working hours.
- C. Natural Gas: The Contractor shall provide and install gas equipment and piping necessary to perform his work, and shall remove same upon completion of the work. The Contractor shall pay for the Natural gas used in the work.
- D. Telephone/Communications/Data:
1. Make necessary arrangements and pay costs for installation and operation of telephone, communication, or data service to the Contractor's office at the site.
- E. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.
- F. Make required connections to existing utility systems with minimum disruption to services in the existing utility systems. When disruption of the existing service is required, do not proceed without the Architect and/or Inspector's approval with at least 72 hours written request and approval. When required, provide alternate temporary service, should it be necessary as deemed by the Architect and/or Inspector, or Project Manager.
- 1.03 CONTRACTOR'S FACILITIES:
- Contractor shall provide temporary offices, storage sheds, fencing, barricades, signage, hoists, scaffolds, railings and other facilities as required and specified. Installation and maintenance of such items shall be the responsibility of the Contractor.
- A. Temporary Offices for Contractor, the District Project Manager and District Inspector of Record.
1. Not Required.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

B. Sanitary Facilities:

1. The Contractor shall provide temporary toilet facilities which may consist of portable chemical toilets, and hand washing equipment. Number of toilets shall be based on number of workers with a minimum of 1 toilet facility per 10 workers. Placement of temporary toilet facilities shall be agreed upon at the site with the District Construction/Project Manager.
2. Toilet facilities shall be kept supplied with toilet paper, and kept in a clean and sanitary condition until completion of the work, and then be removed from the work site. Upon removal, that portion of the site shall be properly cleaned and graded/repaired.

C. Contractor's Security Barricade:

1. The Contractor shall erect the temporary security barricades for the purpose of defining construction lay-down areas, staging area and work zones. Temporary security barricades shall be provided on school site at exterior locations, and at building interiors, as necessary to provide a clear, obvious separation between school users and construction personnel. New or used material may be used.
2. Unless otherwise indicated or specified, barricade shall be constructed of 6'-0" high chain link fence material with T-post condition at bottom for stability, shall have top rails, and 6 gauge minimum wire support at the bottom, BLACK screen material securely attached to the chain link material. Space posts not to exceed 10 feet on centers. Posts shall be of the following nominal pipe dimensions: terminal, corner, and gate posts 2-1/2", line posts 2", with diagonal supports at each corner. Chain link fabric shall be not less than 13 gauge, 2" mesh, and in one width. Posts, fabric and accessories shall be galvanized. Some fencing may require terminal posts to be sunk in the ground, or with appropriately placed concrete footings, and/or may require sandbags for ballast, as determined by the Inspector and/or Project Manager.
3. Chain link fencing shall be free from barbs, icicles or other projections resulting from the galvanizing process, and shall be knuckle-knuckle. Fence fabric having such defects will be rejected even though it has been erected.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

4. Gates shall be fabricated of steel pipe with welded corners, and horizontal and diagonal bracing as required to prevent flexing. Fabric to be attached to the frame at 12 inch centers. Provide all gate hardware of a strength and quality to perform satisfactorily until the barricade is removed upon completion of the work. Provide locks sufficient to secure the area, and that can be opened with one hand (e.g. combination locks).
 5. At the completion of the work, remove barricade and concrete post footings from the site; backfill and compact fence footing holes by patching with like materials. Existing surface paving that is cut into or removed shall be patched and sealed to match the surrounding areas with like materials, and in the same finishes.
 6. Contractor shall maintain all fencing and gates in good order on a daily basis, including the masking of graffiti as deemed necessary by the Inspector, and/or Project Manager, and shall secure the project fencing and gates at the end of every work day.
- D. Other Enclosures:
1. Provide temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, and/or to allow for temporary heating and for necessary security.
 2. Provide protective barriers that shall be at least 4' in height, and extend to protect all areas at tree drip lines, around plants and other improvements designated to remain, as determined by the Inspector and/or Project Manager and related specification sections.
- E. Storage Yards and Storage Containers:
1. The Contractor shall fence and maintain storage yards in an orderly manner.
 2. Provide steel storage containers, lockable, free from graffiti, and in good condition for materials and equipment that cannot be stored offsite or in a bonded and agreed-upon warehouse.
 3. Exact location, size and access of storage yards and steel storage containers shall be approved by the District Construction/Project Manager.
 4. Remove storage yards and containers as rapidly as progress of the work will permit.

1.04 HARD HAT SIGN

- A. Contractor shall post a sign at each gate and/or entry to any area of construction, identifying the job site as a "hard hat area". No person without a hard hat shall be allowed in the sections of the project under construction. This shall be the responsibility of the Contractor's Project Safety Inspector to enforce.

1.05 DUST AND NOISE CONTROL

- A. Throughout the entire construction period, Contractor shall maintain dust control by use of water or other environmental controls as may be approved by the Architect, Inspector, and/or Project Manager.
- B. Noise Control: Muffle all equipment to a maximum of 85 Dba at 5' from equipment. Noise control is to be kept to a minimum to perform the operations of construction. NO Radios or projected sound will be allowed on the job site.

1.06 GENERAL ITEMS

- A. Staging areas for delivery of materials and equipment will be at locations designated by the drawings and specifications, and/or as approved by the Architect, Inspector, and/or Project Manager.
- B. Safety and Security Lighting: Provide 5 foot candles outside.
- C. Noise Control: Muffle all equipment to a maximum of 85 Dba at 5' from equipment.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Protection for Products, including District - Provided Products, After Installation.
- B. Protection of Existing Utilities and Interference.

1.02 EXISTING UTILITIES

- A. The known existing utilities are shown on the drawings in their approximate location and the Prime Trade Contractor shall exercise care in avoiding damage to these facilities as the Prime Trade Contractor will be held responsible for their repair if damaged. Hand excavation shall be utilized when digging in close proximity to existing utilities. The District's Architectural Team does not guarantee that all utilities or obstructions are shown or that the locations indicated are accurate.
- B. No work shall be performed on energized electrical equipment unless scheduled with the District Inspector of Record. The District Inspector of Record reserves the right to specify specific conditions for all work involving energized high voltage electrical equipment, and its scheduled modification proposal.
- C. If interferences occur at locations other than the general locations shown on the plans, and such utilities are damaged before their locations have been established, or create an interference, the Prime Trade Contractor shall notify the District's Construction/Project Manager and a method for correcting said interference shall be supplied by the District's Engineering representatives. Payment for additional work due to interferences not shown on the plans shall be in accordance with the General Conditions.
- D. Drawings showing location of equipment, piping, etc., are diagrammatic and job conditions will not always permit their installation in location shown. When this situation occurs, bring to the District Architect's, and/or Inspector's attention immediately to determine relocation in joint conference.
- E. Information shown relative to existing power and signal service is based upon available records and data but shall be regarded as approximate only. Minor deviations found necessary to conform to actual locations and conditions shall be made without extra cost to the District.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PROTECTION AFTER INSTALLATION

- A. Adequately protect all installed equipment and materials until completion and acceptance by the Architect, Inspector, and Project Manager.

- B. Protect installed products and control traffic in immediate area to prevent damage in subsequent operations.
- C. Provide protective coverings at walls, projections, corners, and jambs, sills, and stiff openings in and adjacent to traffic areas.
- D. Cover walls and floors of elevator cabs, and jambs of cab doors, when elevators are used by construction personnel. Protect elevator area until final acceptance.
- E. Protect finished floors and stairs from dirt, wear, and damage:
 - 1. Secure heavy sheet goods or similar protective materials in place, in areas subject to construction foot traffic, and/or material deliveries.
 - 2. Lay planking or similar rigid materials in place, in areas subject to movement of heavy objects over existing surfaces.
 - 3. Lay planking or similar rigid materials in place in areas where storage of products will occur.
- F. Protect waterproofed and roofed surfaces:
 - 1. Restrict use of surfaces for traffic of any kind, and for storage of products.
 - 2. When an activity is mandatory, obtain recommendations for protection of surface from manufacturer. Install protection and remove on completion of activity. Restrict use of adjacent unprotected areas.
- G. Restrict traffic of any kind across planted lawn and landscape areas through the use of temporary barricades, fencing, signage, and until final acceptance and maintenance period.
- H. Care shall be exercised to prevent damage to adjacent facilities including walks, curbs, and gutters, etc. Where equipment will pass over these obstructions, suitable planking and protection shall be placed, and damaged facilities, due to the Contractor(s) operations, shall be removed and replaced at the Prime Trade Contractor's expense.
- I. Prime Trade Contractor shall be responsible for overloading of any part or parts of structures beyond their safe calculated carrying capacities by placing of materials, equipment, tools machinery or any other item thereon.
- J. All existing improvements and facilities shall be protected from damage of any type resulting from the operations, equipment or workers of the Contractor(s) during the time the project.
- K. All damaged work shall be replaced, repaired and restored to its original condition with no additional cost to the District.

- L. Where existing utilities are damaged or disrupted on account of any act, omission, neglect or misconduct by the Contractors in the manner or method of executing the work, or due to non-execution of work, such damage shall be immediately repaired to maintain operation regardless of the time of occurrence with no cost to the District.
- M. Provide temporary construction necessary for protection of the building and their parts. Close buildings as soon as possible as protection from the weather and vandalism. Protect existing buildings and controlled temperature areas from excessive temperature variances below 68 degrees Fahrenheit, and above 76 degrees Fahrenheit, and from any damage.
- N. Protect doors, millwork and mill counters and cases and hardware from damage, including abrading and scratching of finishes.
- O. Protect doors and frames and hardware from mechanical damage and damage to finish coatings.
- P. Remove protective coatings, wrappings, temporary coverings, etc., as required to leave work in condition for painting and finishing, final cleaning, etc.
- Q. Protect all exterior work, including existing asphalt paving, concrete flatwork, common sidewalk, and City curb, gutter, and aprons. Protect all existing and newly placed landscaping and irrigation systems.
- R. Repair or replace all damaged work promptly as directed by District Construction/Project Manager, District IOR, or District Architect at no cost to the District.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Security Program.
- B. Entry Control.
- C. Personnel Identification.
- D. Miscellaneous Restrictions

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 SECURITY PROGRAM

- A. Protect work, existing premises, and School operations from theft, vandalism and unauthorized entry.
- B. Security of the job area shall be strictly maintained. The Prime Trade Contractor shall be responsible for keeping areas involved in the work locked and secure at all times when work is not in progress, and no Contractor representative is on site.

3.02 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities under construction. Allow entrance only to authorized persons with proper identification, and appropriate footwear, and hard hats, as determined by the Contractor Project Safety Inspector, and/or District Inspector.
- B. Prime Trade Contractor shall control entrance of own persons and vehicles related to construction operations in accordance with the conditions during work, and not allow intrusion by others.

3.03 BADGES AND ESCORT REQUIREMENTS

- A. All personnel shall wear badges distinguishing personnel requiring an escort (YELLOW badges) to areas of the campus outside of the work area from those not requiring an escort (GREEN badges).
- B. Personnel without fingerprint and acceptable background check on file with the District shall require an escort to any area outside of the work area.
- C. The Contract and Pre-Construction meeting wording lays out the appropriate procedures for Contractor and Subcontractor personnel in working on the school site.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Environmental Mitigation requirement for this project is recorded in this Specification Section 01 56 40. The measures mitigations may include, but are not limited to, procedures and standards to control:
 - 1. Dust
 - 2. Noise
 - 3. Fumes
 - 4. Timing of work activities
 - 5. Erosion
 - 6. Archaeological resources found during excavation
 - 7. Preservation of trees
 - 8. Demolition process and materials.

1.02 EXECUTION

- A. The Contractor shall comply with the mitigation below in terms of what is to be controlled, acceptable methods, and standards (e.g. equipment must be muffled and noise levels may not exceed specified decibel levels).
- B. The Contractor shall provide documentation of having met the mitigation requirements as described below to the Inspector and/or Project Manager within five (5) working days of the Notice to Proceed and at each phase of the project.
- C. To reduce dust emissions and noise during construction by implementing the following:
 - 1. Exposed surfaces should be watered twice daily.
 - 2. Stockpiles of excavated materials should be covered.
 - 3. Trucks carrying excavated materials from the site should be covered and should have their tires and undercarriages washed prior to exiting the site.
 - 4. Streets affected by fugitive sand and dust are to be swept regularly by Prime Trade Contractors responsible for tracking of mud and/or sand to these streets.
 - 5. Uncovered soil should be bound (by grass or similar groundcover) as soon as is reasonably possible.
 - 6. Excavation should not be conducted when surface winds exceed 11 mph.
 - 7. Unnecessary idling of construction vehicles and equipment should be avoided adjacent to areas of instruction, or adjacent to fresh air ductwork, or where noise will affect the areas of instruction.
 - 8. Limit construction activities to a schedule that minimizes disruption as much as possible to area residences surrounding the project site property boundaries.
 - 9. Schedule activities with the highest noise potential for the times when disruption of any instruction, or area of residences surrounding the project site will be at a minimum.

10. Require contractors to employ the lowest-decibel level equipment, or employ alternative equipment or to muffle/control noise from available equipment to the maximum extent possible.
11. Perform noisy operations (e.g., mixing concrete, hydraulic/mechanical demolition) off-site or on portions of the site furthest from noise sensitive receptors whenever possible, and in consult with the Inspector and/or Project Manager.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Surveying and Field Engineering Services.

1.02 QUALITY CONTROL

- A. Land Surveyor: Registered in the State of California and acceptable to the District's Architect, Inspector, and/or Project Manager.

1.03 LINES AND GRADES

- A. The Contractor shall provide all construction survey work required for the accurate location of the work. Horizontal and vertical control for the work shall be from the project reference marks as shown on the Drawings. In all questions arising as to the proper location of the work, the District's A&E teams, and the Inspector's decision shall be final.
- B. The Contractor shall verify final configuration of the project during demolition work. Minor adjustments of the work to accommodate existing field conditions shall be the responsibility of the Contractor.
- C. Replace, at no increase in Contract Sum, control points which may be lost or destroyed; base requirements on original survey control.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify locations of survey control points prior to starting work. Promptly notify District Architect and Inspector of any discrepancies discovered.

3.02 SURVEY REFERENCE POINTS

- A. Protect survey control points prior to starting site work; preserve permanent reference points during construction. Make no changes without prior written notice to the Architect and Inspector.
- B. Promptly report to the Architect and the Inspector the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated survey points based on original survey control.

3.03 SURVEY REQUIREMENTS

- A. Establish a minimum of three (3) permanent bench marks on site, referenced to establish control points. Record locations, with horizontal and vertical data, on Project Record Documents.

- B. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements, including pavements; stakes for grading, fill and topsoil placement; and utility locations, slopes and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, and ground floor elevations.
 - 4. Controlling lines and levels required for mechanical and electrical work.
 - 5. Verify layouts as Work proceeds to assure compliance with required lines, levels and tolerances.
- C. Periodically certify layouts by same means, with same approvals by the Architect and Inspector.

3.04 RECORDS

- A. Maintain a complete and accurate log of all control and survey Work as it progresses.
- B. On completion of foundation walls and major site improvement, including underground utilities, prepare a certified survey showing all dimensions, locations, angles, and elevations of construction to the Architect and Inspector for review and approval of the final survey for the Project record.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES.

- A. Maintain premises and adjacent public and private properties free from accumulations of waste, debris, and rubbish, caused by operations during the project.
- B. At completion of Work, remove waste materials rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces; leave project clean and ready for occupancy.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Use only cleaning materials recommended by the manufacturer of surface to be cleaned.
- B. Use cleaning materials only on proper surfaces recommended by the manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION:

- A. Execute daily cleaning plans from each trade to ensure that buildings, grounds, and public and private properties are maintained free from accumulations of waste materials, rubbish and trash on a daily basis.
- B. Wet down dry materials and rubbish to prevent blowing dust and debris on and from the construction work.
- C. Daily, during progress of work, clean construction site and utilized public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site steel dump containers and appropriately sized trash containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off the District's property.
- F. Vacuum clean and wet wipe interior building walls, floors, doors, windows, and hardware in preparation for and when ready to receive finish preparation and painting. Continue vacuum cleaning on an as-needed basis until building is ready final inspection by the Architect, Inspector, and Project Manager and determined to be ready for substantial completion and occupancy.

- G. Handle materials in a controlled manner to minimize any unnecessary waste or debris emanating from the construction areas. Do not drop or throw materials from heights: rather, a closed chute shall be used, to minimize unnecessary dust, waste or debris from the construction area.
- H. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not migrate into new equipment or furniture, or onto wet, newly painted surfaces.

3.02 FINAL CLEANING:

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. Exterior: Clean surfaces of the construction and site including, but not limited to, fixtures, walls, soffits, floors, hardware, roofs, window and opening ledges and sills, horizontal projections, steps and platforms, walkways, rails and all like surfaces, and adjoining private and public property to the extent soiled by the Contractor's operations.
- C. Interior: Leave all horizontal and vertical surfaces in vacuum cleaned, wet-wiped condition with all dust, dirt, stains, hand marks, paint spots, droppings, and other blemishes and defects completely removed, and conform to the following requirements:
 - 1. Hard Floors: Freshly administer specified product sealants, and Wet mop/wash and dry, concrete, portland cement flooring, tile, elastomeric, epoxy, refinished and colored concrete, and similar hard floor surfaces free of dust, streaks or stains.
 - 2. Resilient Flooring: Freshly wax and buff as specified in Section 09650.
 - 3. Wood Flooring: Remove defects and blemishes by sanding surface and painting according to Section 09900.
 - 4. Resilient Bases: Clean off adhesive smears and wipe clean with wet-wipe methods.
 - 5. Unpainted and Painted Surfaces: Clean of dust, lint, streaks or stains, utilizing wet-wipe methods as necessary.
 - 6. Tile Walls: Clean and polish per manufacturer's specifications.
 - 7. Hardware and Metal Surfaces: Clean and polish all exposed surfaces using non-corrosive and nonabrasive materials.
 - 8. Glass: Wash and polish both sides, and leave free of dirt, spots, streaks, and labels. Clean and polish mirrors.
 - 9. Ceilings: Clean and free of stains, hand marks, and defacing.
 - 10. Replace air conditioning filters as specified in Mechanical Specifications.
 - 11. Clean ducts, blowers and coils, if air conditioning units were operated without filters during construction, and after final inspection.
 - 12. Lighting fixtures: Replace lamps and clean fixtures and lenses if fixtures or lamps are dirty or have smudges or dust.

13. Fixtures and Equipment: Clean and polish mechanical and electrical fixtures and like items. Leave lighting fixtures free of dust, dirt, stains or waste material. Clean and service equipment and machinery, leaving ready for use.
 14. Surfaces Not Mentioned: Clean according to the intent of this Section and as required for Architect's approval.
- D. Contaminated Earth: Final clean-up operation includes the removal and disposal of earth that is contaminated or unsuitable for support of plant life in planting areas, and filling the resulting excavations with suitable soil as directed and approved by the Architect, Inspector, and/or Project Manager.

Contaminated areas include those used for disposal of waste concrete, mortar, plaster, masonry, paints, and similar materials, and areas in which washing out of concrete and plaster mixers or washing of tools and like cleaning operations have been performed, and all areas and adjacent areas that have been oiled, paved, or chemically treated.

Do not dispose of waste, oil, solvents, paints, solutions, or like penetrating material by depositing or burying on School property; dispose of such material in a lawful manner.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for closing-out Project.

1.02 RELATED SECTIONS

- A. Closeout Submittals: See Respective Specification Sections.

1.03 GENERAL

- A. As a prerequisite for final payment release, Contractor shall complete the work of this Section.
- B. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

1.04 PRE-FINAL INSPECTION; SUBSTANTIAL COMPLETION

- A. Pre-final Inspection:
 - 1. Upon "substantial completion" of the Work AS AGREED TO BY Contractor, Architect/Engineer, DSA Inspector of Record and District Project Manager, Contractor shall notify Architect/Engineer, and DSA Inspector and request a "pre-final inspection" of the Work.
 - 2. If Architect/Engineer, Inspector, and Project Manager concur that work of the contract project/phase is "substantially complete", he will review and list any items that need to be corrected on a punch list. List will be amended as required to include items on the correction or punch list subsequently observed.
- B. Substantial Completion Defined: "Substantial Completion" of the Work is the status, as approved by the Architect/Engineer when construction is sufficiently complete, in accordance with the Contract Documents, so the District/Owner can occupy or utilize the Work for the use for which it is intended.

1.05 FINAL INSPECTION

- A. Reference: See Supplementary Conditions.
- B. Final Inspection: When Contractor has complied with above Article at the end of the final phase, Architect/Engineer and DSA Inspector and Project Manager will review the Work and list any items that are not completed or need to be corrected.
- C. Contractor shall complete and/or correct the Work in a timely manner as outlined in the contract documents.

1.06 GUARANTEES

A. General: Contractor shall guarantee in writing to District/Owner that:

"Contractor will repair or replace any or all of such work, together with any other adjacent work which may be displaced in connection with such replacement, that may prove to be defective in workmanship or material within a period of one year from the date of acceptance of the above mentioned structure by the Glendale Unified School District, ordinary wear and tear, and unusual abuse or neglect excepted."

B. Format: Contractor shall submit guarantees typed in the format indicated in "Guarantee Form".

C. Number of Copies: Submit in triplicate (3) to Architect/Engineer with one electronic pdf.

D. Required Guarantees:

1. General: Submit all guarantees listed herein or required by various Spec. Sections.

2. General Guarantee:

a. By General Contractor; For the Entire Work: 1 Year.

3. Specific Guarantees:

<u>SPEC DIVISION</u>	<u>ITEM</u>	<u>TIME PERIOD</u>
a. Division 6	Custom Casework	2 Years
b. Division 7	Built-up Roofing	10 Years
	All Flashing & Sheet Metal, in connection with roof coverings	5 Years
	All Joint Sealants	5 Years
	Damp proofing	2 Years
c. Division 8	Hollow Metal Doors & Frames	2 Years
	Wood Doors	Lifetime
d. Division 9	Acoustical Ceiling Systems	2 Years
e. Division 10	Porcelain Enamel Liquid Marker Board Surfaces	Lifetime
	Toilet Compartments	Lifetime
	Operable Walls	3 Years
	Toilet Accessories	1 Years
f. Division 11	Equipment Projector Screen	1 Years
	Laboratory Equipment and Cabinets	Lifetime
g. Division 12	Furnishings Vertical Blinds	Lifetime
h. Division 14	Hydraulic Elevator	1 Year
	Wheelchair Lift.....	1 Year

- I. Division 22 Plumbing 1 Year
HVAC Systems 1 Year
Temperature Controls for
HVAC Systems 1 Year
- j. Division 26 All Electrical Work 1 Year

1.07 WARRANTIES

- A. General: Comply with Section 017836. Submit all warranties required by various Specification Sections.

1.08 CERTIFICATES

- A. General: Submit in triplicate (3) all certificates required by various Specification Sections or listed herein, notarized as required.
- B. Certificates:
 - 1. Division 8: Finish Hardware installation acceptance.
 - 2. Division 28: Fire Alarm System testing and approval.

1.09 OPERATION AND MAINTENANCE DATA

- A. General: Submit all manuals required by various Specification Sections or listed herein; three (3) copies each, and one electronic pdf. Provide durable binders, no less than 8-1/2" x 11" in size and provide the following information:
 - 1. Identification on, or readable through, the front cover stating general nature of the manual.
 - 2. Neatly typewritten index at the front of the Manual, furnishing immediate information as to location in the Manual of all data or equipment included.
 - 3. Complete instructions regarding operation and maintenance of all equipment included.
 - 4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.
 - 5. Copy of all Guarantees and Warranties issued.
 - 6. Copy of the approved Shop Drawings with all data concerning changes made during construction.
- B. Extraneous data: Where contents of Manuals include Manufacturers' catalog pages, clearly indicate the precise items included in this installation by clouding, or highlighting, and delete, all manufacturers' data with which this installation is not concerned.

1.10 RECORD DRAWINGS

- A. Procedures:
 - 1. Promptly following contract award, General Contractor shall secure from the District one complete set of Drawings. Identify the set as "Record."
 - 2. Timing of Entries: Make entries within 24 hours after receipt of information on any changes by Contractor or Sub Contractors.

3. Contractor shall be responsible for maintaining and recording the changes on the set, and by affixing any related RFI, COR, and/or ASI applicable to the changes.
4. Do not use the "Record" set for any purpose except entry of new data and for review by the Architect. Maintain separate job sets for subcontractors and workers daily use.
5. Maintain the "Record" set at the job site where designated by the Architect/Engineer, in conjunction with the DSA Inspector.
6. Use all means necessary to protect the "Record" set from deterioration, loss or damage until completion of the work.
7. Making entries on Drawings: Using an erasable colored pencil, other than blue or black, not ink or indelible pencil, and clearly describe the change by note and by graphic line as required. Date all entries. Call attention to the entry by a "cloud" around the area or areas affected. In the event of overlapping changes, different colors may be used for each of the changes.
 - a. Changes due to approved change orders may be indicated by referencing the change order number and scope of change in lieu of revising the Drawings.
 - b. The location and depth below finish grade or above ceilings and attic spaces of utilities shall be fully dimensioned and indicated on Drawings. Dimensions shall be taken to building lines or permanent landmarks.
8. The architect's approval of the current status of the "Record" drawings will be a prerequisite to the Architect/Engineer's and DSA Inspector's approval of requests for progress payments and request for final payment release.
 - a. Progress approvals: Prior to submitting each request for progress payments, secure the District DSA Inspector's approval of the status of the "Record" Drawings.
 - b. Prior to submitting request for final payment and final inspection, General Contractor shall submit the "Record Drawing" set to the District DSA Inspector, with transmittal letter, in duplicate, for approval and further processing through the Architect/Engineers for their approval and acceptance, and delivery to the District.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUBMITTAL REQUIREMENTS:

- A. Assemble Warranties, Bonds, and Service and Maintenance Contract, executed by each of the respective Manufacturers, Suppliers, and Subcontractors, and submit to the Architect/Engineer for review and approval before Final Payment will be approved and released.
- B. Number of original signed copies required: Three (3) each and one electronic pdf.
- C. Table of Contents Neatly typed in orderly sequence.
- D. Provide complete information for each item:
 - 1. Product or work Item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Beginning date of Warranty, Bond, or Service and Maintenance Contract.
 - 4. Duration of Warranty, Bond of Service, and Maintenance Contract.
 - 5. Provide the following information for District/Owner's Personnel:
 - a) Procedure in case of failure or malfunction.
 - b) Instances which affect Warranty or Bond validity.
 - 6. Contractor, name of responsible principal, address, telephone number and email address.

1.02 SUBMITTAL FORM:

- A. Punch sheets for standard 3-ring binder.
- B. Size: 8-1/2 x 11 inches.
- C. Fold larger sheets to fit into binder.
- D. Cover: Identify each packet with typed or printed title 'WARRANTIES AND BONDS' 1st:
 - 1. Title of Project.
 - 2. Name of Contractor.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Remove designated building equipment and fixtures.
- B. Identify and cap discontinued utilities including underground utilities.
- C. Carefully demolish and remove from the Site those items scheduled to be so demolished and removed. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the Contract, including, but not limited to, the following items:
 - 1. Protection of existing items to remain.
 - 2. Barricades, lights, signs and safety precautions required by the governing code.

1.02 RELATED WORK

- A. Documents affecting work of this Section include, but are not limited to, General Conditions, Supplementary Conditions, and Division 1 of these Specifications.
- B. Relocation of utility lines and mechanical structures scheduled to remain active.

1.03 GENERAL REQUIREMENTS

- A. Codes: Perform Work in accordance with appropriate Codes, and California Fire Code, latest edition, "Article 87 - FIRE SAFETY DURING CONSTRUCTION, ALTERATION, OR DEMOLITION OF A BUILDING."
- B. Examine the Site, conditions, and limitations thereon and thereabouts. Bidding shall take into account such conditions and limitations, whether or not the same are specifically mentioned in the Contract Documents, and every bid shall be construed as including whatever sums are needed to complete the Work in every part as shown, described, or reasonably required or implied, and attain the completed conditions contemplated by the Contract. The demolition drawings, including demolition work shown on construction drawings, shall be considered as a guide only. The exact extent of the demolition and reconstruction work shall be determined by a site visit and investigation.
- C. Make note of existing asbestos, including asbestos lined pipes, ductwork and equipment. Removal of asbestos shall be executed by Contractor. Coordinate Work with trades contracted by Owner to execute the asbestos removal.
- D. The use of explosives will not be permitted.
- E. Partial Removal: Items scheduled to be removed and of salvageable value to Contractor may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed. Partial removal is subject to the following conditions:
 - 1. Storage or sale of removed items on site will not be permitted.
 - 2. This excludes items and materials to be stored for Owner.
- F. Unforeseen Conditions: Include in the base bid miscellaneous cutting and patching necessitated as a result of unforeseen conditions. No extra payments based on the pleas of unforeseen conditions will be allowed.
- G. Noise control: Carry on work in a manner which will produce the least amount of noise. Instruct workmen in noise control procedures.
- H. Removal of abandoned lines, vaults, the erasing of easements, and similar work is a responsibility of the local governmental authority having jurisdiction.

- I. Conduct demolition to minimize interference with adjacent building areas. Maintain protected access at all times.
- J. Provide and erect temporary barriers and security devices.

1.04 QUALITY ASSURANCE

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.05 SUBMITTALS

- A. Schedule: Submit proposed methods and operations of building demolition to Architect for review prior to start of Work. Include in schedule, coordination for shut-off, capping, and continuation of utility services, as required.
- B. Submit five (5) copies of demolition and removal procedures and schedule for Architect's review.
- C. Upon completion of the work in this Section, submit Record Drawings recording the extent of active and abandoned underground utilities. The drawings shall be signed and dated by the Contractor and shall be drawn on reproducible sepia. Submit drawings to Inspector of Record and/or transmittal to Architect.

PART 2 - PRODUCTS

2.01 SALVAGE CONTAINER

- A. Provide one (1) lockable steel container, 8' x 8' x 20'.
- B. Place container where directed by District.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Site Security: Erect chain link fence barricades, warning lights, and signs as required by the governing building code, to protect persons from injury, to prevent trespassing, and to prevent theft or damage due to vandalism.
- B. Erect weatherproof closures for exterior openings as specified in Section 01 50 00.

- C. Notify utility authorities to locate and flag underground lines. Disconnect, remove, and cap designated utility services within demolition areas.
- D. Mark location of disconnect utilities. Identify and indicate capping locations on Project Record Documents.
- E. Avoid cutting existing pipe, conduit, or ductwork serving the building but then scheduled to be removed or relocated until provisions have been made to bypass them.
- F. Protect landscaping and irrigation systems unless scheduled to be altered.
- G. Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
 - 1. Erect temporary covered passageways as required by authorities having jurisdiction.
 - 2. Provide interior and exterior shoring, bracing, or support as required to prevent movement, settlement, or collapse of building structure to remain.

3.02 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.03 DEMOLITION

- A. By careful study of the Contract Documents, determine the location and extent of selective demolition to be performed.
- B. In company with the Architect, visit the Site and verify the extent and location of selective demolition to be performed.
 - 1. Carefully identify limits of selective demolition.
 - 2. Mark interface surfaces as required enabling workmen to identify items to be removed and items to be left in place intact.

- C. Prepare and follow an organized plan for demolition and removal of items.
 - 1. Shut off, cap, and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction. Review plans, and confer with the Architect, to determine which lines are to be abandoned and which are to be kept active.
 - 2. Completely remove items scheduled to be demolished and removed.
 - 3. Comply with pertinent regulations of governmental agencies having jurisdiction.
- CI. Demolished material shall be considered to be property of the contractor and shall be completely removed from the job site. Burning of removed materials from demolished structures will not be permitted on Site.
- CII. Demolish in an orderly and careful manner. Protect existing supporting structural members and finishes which are not to be demolished. Unless shown on the Drawings, no structural elements such as rafters, joists, columns, or studs shall be cut without written permission from the Architect and Division of the State Architect (DSA).
- CIII. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.

3.04 POLLUTION CONTROLS

- A. Use water sprinkling, temporary enclosures and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
 - 1. Do not use water when it may create hazardous or objections such as ice, flooding, and pollution.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to start of Work.

3.05 TRAFFIC

- A. Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
- B. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

3.06 UTILITY SERVICES

- A. Maintain existing utilities; keep in service, and protect against damage during demolition operations.
- B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- C. Owner will shut-off utilities serving structures. Disconnecting and sealing indicated utilities before starting demolition operations is part of this work.
- D. Locate and protect those irrigation devices which are to remain in use and not be replaced or relocated within the area of demolition or workers' vehicular traffic throughout the entire period of the Project.
- E. Buildings that house public address systems and fire alarm, typically in Administration Buildings are to have power maintained at all times. If power must be interrupted, Contractor must give two (2) weeks prior notice for approval and schedule with District for interruption over weekends or when school is not in session.

3.07 REPLACEMENTS

- A. In the event of demolition of items not so scheduled to be removed and/or replaced, promptly replace such items to the acceptance of the Architect and at no additional cost to District.
- B. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no additional cost to District.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members and support members.
- B. Baseplates, and anchor bolts.
- C. Grouting under baseplates.

1.02 REFERENCES

- A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.
- B. ASTM A36 - Carbon Structural Steel.
- C. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- D. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- E. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- F. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- G. ASTM A490 - Structural Bolts, alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
- H. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- I. ASTM A992 - Standard Specification for Steel for Structural Shapes for Use in Building Framing.
- J. ASTM C1107 - Packaged Dry, Hydraulic Cement Grout (non shrink).
- K. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 KSI Yield Strength.

- L. AWS A2.4 - Standard Welding Symbols.
- M. AWS D1.1 - Structural Welding Code - Steel.
- N. ANSI / ASCE 360 - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- O. ANSI / ASCE 303 - Specification for Architectural Exposed Structural Steel.
- P. SSPC - The Society for Protective Coatings.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings:
 - Indicate profiles, sizes, spacing, and locations of structural members, connections, cambers and loads.
 - Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Submit under provisions of Section 01 33 00 certifying that products meet or exceed specified requirements.
- D. Mill Test Reports: Submit under provisions of Section 01 33 00 Manufacturer's Certificates, indicating structural strength and destructive and non-destructive test analysis.
- E. Welders' Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. Perform Work in accordance with AISC - Specification for Architectural Exposed Structural Steel where indicated on the drawings.

1.05 QUALIFICATIONS

- A. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of California.
- B. Design connections in accordance with CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 22A.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Structural Steel Members: ASTM A36. W and WT shapes, ASTM A992.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Steel Pipe: ASTM A53, Grade B.
- D. Shear Stud Connectors: ASTM A108, Grade 1015, forged steel, headed, unfinished.
- E. Threaded Bolts, Nuts, and Washers: ASTM A36
- F. Anchor Bolts: ASTM F1554
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.

2.02 FABRICATION

- A. Fabricate structural steel members in accordance with AISC Specification.
- B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

2.03 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP-2.
- B. Shop and Touch-Up Primer: SSPC 15, Type 1, Red Oxide.
- C. Shop prime structural steel members. Do not prime surfaces that will

be fireproofed, field welded or in contact with concrete or masonry.

- D. Finish: Site paint exposed to view structural steel members under provisions of Section 09 90 00.

2.04 SOURCE QUALITY CONTROL AND TESTS

- A. Testing and analysis of components will be performed under provisions of Section 01 43 00.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.02 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on Drawings.
- C. Field connect members with threaded fasteners indicated; torque to required resistance.
- D. Do not field cut or alter structural members without approval of Architect.
- E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.03 GROUTING

- A. Clean concrete on masonry bearing surfaces.
- B. Roughen bearing surface prior to setting base and bearing plates.

- C. Set base and bearing plates on wedges, shims, or setting nuts.
- D. Tighten anchor bolts after members are positioned and plumb.
- E. Cut off protruding wedges or shims flush with edge of base or bearing plate.
- F. Pack grout solidly between bearing surfaces and plates so no voids remain.
- G. Finish exposed surfaces, protect installed materials, and allow to cure.

3.04 ERECTION TOLERANCES

- A. Erect structural steel members in accordance with AISC Specification.

3.06 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 43 00.

END OF SECTION

POLYVINYL CHLORIDE (PVC) MEMBRANE ROOFINGGENERAL

1.1 SECTION INCLUDES

- A. Adhered PVC membrane roofing system.
- B. Mechanically fastened PVC membrane roofing system.
- C. Induction welded PVC membrane roofing system.
- D. Cover board.
- E. Roof insulation.
- F. Vapor retarder.
- G. Base sheet.
- H. Substrate board.

1.2 RELATED SECTIONS

- A. Division 03 Section "Lightweight Insulating Concrete" for lightweight insulating concrete.
- B. Division 03 Section "Concrete" for concrete.
- C. Division 05 Section "Steel Decking" for steel roof deck.
- D. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, cants, curbs, and blocking, structural-use roof deck panels.
- E. Division 07 Section "Sheet Metal Flashing and Trim" for flashings and counter flashings.
- F. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 REFERENCES

- A. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms in this Section:
 - 1. ASTM D 1079 "Standard Terminology Relating to Roofing and Waterproofing."
 - 2. Glossary of NRCA's "The NRCA Roofing and Waterproofing Manual."

3. Roof Consultants Institute "Glossary of Building Envelope Terms."

- B. Sheet Metal Terminology and Techniques: SMACNA "Architectural Sheet Metal Manual."

1.4 DESIGN CRITERIA

- A. General: Installed roofing membrane system shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.
- C. Installer shall comply with current code requirements based on authority having jurisdiction.
- D. Wind Uplift Performance: Roofing system shall meet the intent of systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE 7.
- E. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
1. Exterior Fire-Test Exposure: Class A; UL 790, for application and roof slopes indicated.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data sheets for each product to be provided.
- B. Detail Drawings: Provide roofing system details and details of attachment to other work, including:
1. Base flashings and membrane terminations.
 2. Tapered insulation, including slopes.
 3. Crickets, saddles, and tapered edge strips, including slopes.
 4. Insulation fastening and adhesive patterns.
- C. Verification Samples: Provide for each product specified.
- D. Installer Certificates: Confirmation that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

- E. Maintenance Data: Refer to Johns Manville's latest published documents on www.JM.com.
- F. Guarantees: Provide manufacturer's current guarantee specimen.
- G. Prior to roofing system installation, roofing sub-contractor shall provide a copy of the Guarantee Application Confirmation document issued by Johns Manville Roofing Systems indicating that the project has been reviewed for eligibility to receive the specified guarantee and registered.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product who is eligible to receive the specified manufacturer's guarantee.
- A. Manufacturer Qualifications: Qualified domestic U.S. owned and based manufacturer that has UL listing or accredited testing agency listing for roofing system identical to that used for this Project.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 329.
- C. Test Reports:
 - 1. Roof drain and leader test or submit plumber's verification.
 - 2. Core cut, if required.
 - 3. Roof deck fastener pullout test, if required.
- D. Moisture Survey, if required:
 - 1. Submit prior to installation, results of a non-destructive moisture test of roof system completed by approved third party. Utilize one of the approved methods:
 - a. Infrared Thermography
 - b. Nuclear Backscatter
- E. Source Limitations: Obtain all components from the single source roofing manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the guarantee.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and guarantee requirements.

1.9 GUARANTEE

- A. Provide manufacturer's system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.
 - 1. Single-source special guarantee includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, adhesives, cover board, substrate board, vapor retarder, base sheet, walkway products, manufacturer's expansion joints, manufacturer's edge metal products, and other approved single-source components of roofing system marketed by the manufacturer.
 - 2. Guarantee Period: 15 years from date of Substantial Completion.
 - 3. Contractor is required to list as the Specifier/Consultant of record in the appropriate fields ("Specifier Account") when applying for the manufacturer's warranty.
- B. Installer's Guarantee: Submit roofing Installer's guarantee, including all components of roofing system for the following guarantee period:
 - 1. Guarantee Period: Two years from date of Substantial Completion.
- C. Existing Guarantees: Guarantees on existing building elements should not be affected by scope of work.

1. Installer is responsible for coordinating with building owner's representative to verify compliance.

PART 2 - PRODUCTS

2.1 POLYVINYL-CHLORIDE ROOFING MEMBRANE - PVC

- A. PVC Sheet: ASTM D 4434, Type III, fabric reinforced. For patching at HVAC.
 1. Thickness: 50 mils (1.27 mm), nominal.
 2. Exposed Face Color: White

2.2 AUXILIARY ROOFING MATERIALS – SINGLE PLY

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's internally reinforced or scrim reinforced, smooth backed membrane with same color as sheet membrane. Basis of design: JM PVC 60 mil
- C. Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for membrane.
- D. Flashing Adhesive: Manufacturer's standard water-based bonding adhesive for base flashings.
- E. Urethane Adhesive: Manufacturer's standard two component no VOC adhesive for fleece backed membranes. Basis of design: JM Roofing System Urethane Adhesive (RSUA)
- F. Urethane Adhesive: Manufacturer's self-contained two-part, low-rise foam adhesive formulated to adhere fleece-backed membranes to substrate. Basis of design: JM Two-Part Urethane Insulation Adhesive Canister
- G. Roofing Asphalt: ASTM D 312, Type IV
- H. Asphalt Primer: ASTM D 41. Basis of design: JM Asphalt Primer
- I. Liquid Applied Flashing: Manufacturer's single ply liquid and fabric reinforced flashing system created with a fleece polyester scrim and a two-component polyurethane based liquid applied flashing material, consisting of a liquid resin

and a curing agent. Basis of design: JM SP Liquid Flashing Resin and JM SP Liquid Flashing Scrim

- J. Liquid Applied Flashing Primer: Manufacturer's single ply liquid flashing primer. Basis of design: JM SP Liquid Flashing TPO and PVC Primer, JM SP Liquid Flashing Concrete Primer, or JM SP Liquid Flashing Metal and Wood Primer
- K. Slip Sheet: Minimum 9.0 oz/yd² needle punched, UV-resistant polyester fabric slip sheet, as required for application. Basis of design: JM Polyester Mat Protection Slipsheet
- L. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors. Basis of design: JM Termination Systems
- M. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- N. Induction Welding Plate: A round specially coated Galvalume® plate with a recessed center and raised flat bonding surface specifically designed for induction welding application. Basis of design: JM PVC RhinoPlate
- O. Polymer Fasteners: Glass-reinforced nylon fasteners with 1/4" square drive and 1" head with Galvalume®*-coated 2" metal stress plates, designed to lock into the fastener head. Fasteners designed for fastening roof insulation to substrate and furnished by roofing system manufacturer. Basis of design: Polymer Auger Fasteners and Plates
- P. Miscellaneous Accessories: Provide all accessories to meet the roofing manufacturer's guarantee requirements.

2.3 WALKWAYS AND SAFETY STRIPS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads sourced from membrane roofing system manufacturer.
- B. Safety Strips: Manufacturer's minimum 45 mils, reinforced, UV-resistant PVC (polyvinyl chloride) with Elvaloy KEE (ketone ethylene ester) safety warning line for roof perimeters. Basis of design: JM PVC Safety Strip

- 1. Exposed Face Color: Yellow

2.4 COVER BOARD

- A. Polyisocyanurate Board: ASTM C 1289, Type II, Class 1 polyisocyanurate bonded in-line to fiber glass reinforced facer.

- B. Perlite Board: ASTM C 728, Type 3; composed of expanded perlite, cellulosic fibers, binders and waterproofing agents with top surface seal-coated. Basis of design: RetroPlus Roof Board.
- C. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 3, High-density Polyisocyanurate technology bonded in-line to mineral-surfaced, fiber glass reinforced facers with greater than 140 lbs of compressive strength. Basis of design: Invinsa Roof Board
- D. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate technology bonded in-line to inorganic coated glass facers with greater than 80 lbs of compressive strength. Basis of design: Protector HD
 - 1. Thickness: 1/2 inch (13 mm)
 - 2. R-value: 2.5
- E. Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications, [1/4 inch (6 mm)] [1/2 inch (13 mm)] [5/8 inch (16 mm)] thick.
- F. Gypsum Fiber Board: ASTM C 1278, non-faced, gypsum and cellulose fiber substrate, 1/2 inch (13 mm) thick. Basis of design: Securock Gypsum-Fiber Roof Board

2.5 ROOF INSULATION – FLUTE FILLER

- A. General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, Product: ENRGY 3
 - 1. Provide metal roof flute filler insulation package with thickness to fill flutes the height of the standing seam.

2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
 - 1. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class [1] Grade [2 (20 psi)] [3 (25 psi)], Basis of design: [ENRGY 3] Provide insulation package with minimum R Value: Match existing adjacent roof insulation.

2. Provide insulation package in multiple layers.
3. Minimum Long-Term Thermal Resistance (LTTR): 5.7 per inch.
 - a. Determined in accordance with CAN/ULC S770 at 75°F (24°C)

2.7 TAPERED INSULATION

- A. Tapered Insulation: ASTM C 1289, Type II, Class [1] Grade [2 (20 psi) provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated.

2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Provide saddles, crickets, tapered edge strips, and other insulation shapes, where indicated for sloping to drain. Fabricate to slopes indicated. Basis of design: Tapered Fesco Edge Strip
- C. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and furnished by roofing system manufacturer.
- D. Polymer Fasteners: Glass-reinforced nylon fasteners with 1/4" square drive and 1" head with Galvalume®-coated 3" metal stress plates, designed to lock into the fastener head. Fasteners designed for fastening roof insulation to substrate and furnished by roofing system manufacturer. Basis of design: Polymer Auger Fasteners and Plates
- E. Urethane Adhesive: Manufacturer's two component polyurethane adhesive formulated to adhere insulation to substrate.
- F. Wood Nailer Strips: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry."

2.9 VAPOR RETARDER

- A. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt. Basis of design: GlasPly IV.
- B. Torch Applied SBS Vapor Retarder: [ASTM D 6163, Grade S, Type I, glass-fiber-reinforced] [ASTM D 6164, Grade S, Type I, polyester-reinforced], SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.

- C. Self-Adhered SBS Vapor Retarder: [ASTM D 6163, Grade S, Type I, glass-fiber-reinforced], SBS-modified asphalt sheet; sand surfaced; suitable for application method specified. Basis of design: DynaGrip Base SD/SA.
- D. Asphalt Primer: ASTM D 41. Basis of design: JM Asphalt Primer
- E. Self-Adhered SBS Vapor Retarder: Tri-laminate woven polyethylene, nonslip UV protected top surface; suitable for application method specified.
- F. Self-Adhered Primer: One-part penetrating primer solution to enhance the adhesion of self-adhering membranes.
- G. Polyethylene Vapor Retarder: ASTM D 4397, [6 mils (0.15 mm)] [10 mils (0.25 mm)] thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

2.10 BASE-SHEET MATERIALS

- A. Base Sheet: ASTM D 4601, Type II non-perforated, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
- B. Base Sheet: ASTM D 4897, Type II, venting, non-perforated, heavyweight, asphalt-impregnated and -coated, glass-fiber base sheet with coarse granular surfacing or embossed venting channels on bottom surface. Basis of design: Ventsulation Felt
- C. Base-Sheet Fasteners: Twin legged factory-coated steel fasteners and Galvalume metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening base-sheet to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Product: Lightweight Concrete (LWC) Base Sheet Fasteners
- D. Base-Sheet Fasteners: Tube, disk and locking staple design, factory-coated steel fasteners and Galvalume metal battens meeting corrosion-resistance provisions in FMG 4470, designed for fastening base-sheet to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Product: UltraLok Locking Impact Fastener
- E. Base Sheet Fasteners: 32 gauge, 1-5/8" diameter tin caps with 11-gauge annular ring shank nails.

2.11 SUBSTRATE BOARD

- A. Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications, matching existing adjacent material.

- B. Gypsum Board: ASTM C 1177, Heavy duty coated glass-mat facer, water-resistant gypsum substrate for adhered roof applications, matching existing adjacent material.
- C. Gypsum Fiber Board: ASTM C 1278, non-faced, gypsum and cellulose fiber substrate, matching existing adjacent material.
- D. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate technology bonded in-line to inorganic coated glass facers with greater than 80 lbs of compressive strength. Basis of design: Protector HD
 - 1. Thickness: 1/2 inch (13 mm)
 - 2. R-value: 2.5

2.12 EDGE METAL COMPONENTS

- A. Expansion Joints: Provide factory fabricated weatherproof, exterior covers for expansion joint openings consisting of flexible rubber membrane, supported by a closed cell foam to form flexible bellows, with two metal flanges, adhesively and mechanically combined to the bellows by a bifurcation process. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.
- B. Coping System: Manufacturer's factory fabricated coping consisting of a base piece and a snap-on cap. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.
- C. Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a snap-on cover. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.
- D. Metal Edge System: Manufacturer's factory fabricated metal edge system used to terminate the roof at the perimeter of the structure. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.
- E. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

2.13 REFLECTIVE COATING

- A. Elastomeric Coating: ASTM D 6083. A multipurpose, acrylic elastomeric coating for use over a variety of substrates. Basis of design: TopGard 4000
- B. Base Coat: One-part acrylic elastomeric, with bleed-blocking properties for coating over asphalt surfaces. Basis of design: TopGard Base Coat

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with the requirements affecting performance of roofing system.
 - 1. General:
 - a. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 - b. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 2. Steel Decks:
 - a. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
 - b. Verify that decking is visibly dry and free of moisture.
 - c. Verify that the decking is smooth and free of large cracks, holes or sharp changes in elevation of the surface.
 - d. When applicable perform pull test with the specific fastener being used on the project to confirm the fastener resistance meets the requirements for that particular system.
 - 3. Ensure general rigidity and proper slope for drainage.
 - 4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
- B. Unacceptable panels should be brought to the attention of the General Contractor and Project Owner's Representative and shall be corrected prior to installation of roofing system.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.

- C. If applicable, prime surface of deck with primer at a rate recommended by roofing manufacturer and allow primer to dry.
- D. Proceed with each step of installation only after unsatisfactory conditions have been corrected.

3.3 RE-ROOF PREPARATION

- A. Remove all roofing membrane, surfacing, coverboards, insulation, fasteners, asphalt, pitch, adhesives, etc.
 - 1. Remove an area no larger than can be re-roofed in one day.
- B. Tear out all base flashings, counterflashings, pitch pans, pipe flashings, vents, sumps and like components necessary for application of new membrane.
- C. Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations.
 - 1. Install decking to match existing as directed by Owner's Representative.
- D. Raise (disconnect by licensed craftsmen, if necessary) all HVAC units and other equipment supported by curbs to conform with the following:
 - 1. Modify curbs as required to provide a minimum 8" base flashing height measured from the surface of the new membrane to the top of the flashing membrane.
 - 2. Secure of flashing and install new metal counterflashing prior to re-installation of unit.
 - 3. Perimeter nailers shall be elevated to match elevation of new roof insulation.
- E. Immediately remove all debris from roof surface. Demolished roof system may not be stored on the roof surface.

3.4 RE-COVER PREPARATION

- A. Prepare existing roof according to roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer, and requirements in this Section.
- B. Tear out all base flashings, counterflashings, pitch pans, pipe flashings, vents, sumps and like components necessary for application of new membrane.
- C. Disable existing roof membrane per manufacturer's written instruction.
- D. Remove existing membrane per manufacturer's written instructions.

- E. Remove and replace wet, deteriorated or damaged roof insulation and decking as identified in moisture survey.
- F. Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations. Install decking to match existing as directed by Owner's Representative.
- G. Raise, (disconnect by licensed craftsmen, if necessary) all HVAC units and other equipment supported by curbs to conform with the following:
 - 1. Modify curbs as required to provide a minimum 8-inch base flashing height measured from the surface of the new membrane to the top of the flashing membrane.
 - 2. Secure top of flashing and install new metal counterflashing prior to re-installation of unit.
 - 3. Perimeter nailers shall be elevated to match elevation of new roof insulation.
- H. Immediately remove all debris from roof surface. Demolished roof system may not be stored on the roof surface.
- I. Install polyester slip sheet as a loosely laid single layer beneath single ply membrane, side and end lapping each sheet a minimum of 3 inches (76.2 mm) and 6 inches (150 mm), respectively. Sheet may be tacked into place as deemed necessary.

3.5 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturer's written instructions.

3.6 BASE-SHEET INSTALLATION

- A. Install one lapped base sheet course and mechanically fasten to substrate according to roofing system manufacturer's written instructions.
 - 1. Enhance fastening rate in perimeter and corner zones according to code requirements, wind uplift system approvals or manufacturer's guarantee requirements, whichever is more stringent.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.

3.7 VAPOR-RETARDER INSTALLATION

- A. Install polyethylene-sheet vapor retarder as a loosely laid single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively.
 - 1. Seal side and end laps.
- B. Install 2 glass-fiber felt plies lapping each sheet 19 inches (483 mm) over preceding sheet. Embed each sheet in a solid mopping of hot roofing asphalt per manufacturer's written instructions.
- C. Install modified bituminous vapor retarder sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
 - 1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
 - 2. Heat weld vapor retarder to substrate according to roofing system manufacturer's written instructions.
 - 3. Adhere vapor retarder in a full mopping of hot asphalt to substrate according to roofing system manufacturer's written instructions.
 - 4. Self-adhere vapor retarder to substrate according to roofing system manufacturer's instructions.
- D. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 - 1. Repair tears and voids in laps and lapped seams not completely sealed.
- E. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.8 FLUTE FILLER INSULATION INSTALLATION

- A. Coordinate installation of roof system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- C. Loose lay Polyisocyanurate flute filler insulation between the metal roof standing seams.

3.9 INSULATION INSTALLATION

- A. Coordinate installation of roof system components so insulation and cover board are not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installation of roof insulation and cover board.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation boards with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer's written instructions. Fill gaps exceeding 1/4 inch (6 mm) with like material.
- E. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- F. Trim surface of insulation boards where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- H. Preliminarily Fastened Insulation [for Mechanically Fastened Membrane Systems]: Install insulation with fasteners at rate required by roofing system manufacturer or applicable authority, whichever is more stringent.
 - 1. Fasten top layer to resist uplift pressure at corners, perimeter, and field of roof.
- I. Adhered Insulation: Adhere each layer of insulation to substrate as follows:
 - 1. Install each layer in a two-part urethane adhesive according to roofing system manufacturer's instruction.
 - 2. Install each layer to resist uplift pressure at corners, perimeter, and field of roof.
- J. Loose Laid Insulation with Top Insulation Layer Mechanically Fastened: Loose lay insulation with staggered joints and secure top layer of insulation to deck using mechanical fasteners designed and sized for fastening specified board-type to deck type.
 - 1. Fasten top layer to resist uplift pressure at corners, perimeter, and field of roof.
- K. Loose Laid Insulation: Loose lay all layers of insulation with staggered joints.

- L. Mechanically Fastened with Subsequent Layers Adhered Insulation: Secure first layer of insulation to deck using mechanical fasteners designed and sized for fastening specified board-type to deck type.
 - 1. Fasten first layer to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Install subsequent layers in a two-part urethane adhesive according to roofing system manufacturer's instruction.
 - 3. Install subsequent layers in a hot roofing asphalt according to roofing system manufacturer's instructions.
 - 4.** Install each layer to resist uplift pressure at corners, perimeter, and field of roof.

3.10 COVER BOARD INSTALLATION

- A. Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.
- C. Install cover board with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer's written instructions. Fill gaps exceeding 1/4 inch (6 mm) with cover board.
 - 1. Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- D. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
 - 1. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- E. Preliminarily Fastened Insulation [for Mechanically Fastened Membrane Systems]: Install insulation with fasteners at rate required by roofing system manufacturer or applicable authority, whichever is more stringent.
 - 1. Fasten top layer to resist uplift pressure at corners, perimeter, and field of roof.
- F. Adhered Cover Board: Adhere cover board to substrate as follows:
 - 1. Install in a two-part urethane adhesive according to roofing system manufacturer's instruction.
 - 2. Install to resist uplift pressure at corners, perimeter, and field of roof.

- G. Mechanically Fastened Cover Board: Install cover board and secure to deck using mechanical fasteners designed and sized for fastening specified cover board to deck type.

- 1. Fasten to resist uplift pressure at corners, perimeter, and field of roof.

3.11 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.
- B. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- C. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.12 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing in accordance with membrane roofing system manufacturer's written instructions.
 - 1. Unroll roofing membrane and allow to relax before installing.
- B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Solvent Based Bonding Adhesive for smooth backed membranes: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- D. Water Based Bonding Adhesive for smooth backed membranes: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

- E. Bonding Adhesive for fleece backed membranes: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- F. Urethane Membrane Adhesive for fleece backed membranes: Apply Urethane Adhesive to substrate at rate required by manufacturer and install fleece-backed roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- G. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roofing membrane with side laps shingled with roof slope, where possible.
- I. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - a. Remove and repair any unsatisfactory sections before proceeding with installation.
 - 3. Repair tears, voids, and incorrectly lapped seams in roofing membrane that do not meet requirements.
- J. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- K. Install roofing membrane and auxiliary materials to tie into existing roofing.

3.13 MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing in accordance with roofing system manufacturer's written instructions.
 - 1. Unroll roofing membrane and allow it to relax before installing.
 - 2. Install sheet in accordance with roofing system manufacturer's written instructions.
- B. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

- C. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- D. Always install membrane laps perpendicular to the steel deck flutes. "Picture Frame" installation method is not permitted.
- E. Apply roofing membrane with side laps shingled with roof slope, where possible.
- F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - a. Remove and repair any unsatisfactory sections before proceeding with work.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
- G. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- H. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.

3.14 INDUCTION WELDED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Always install membrane laps perpendicular to the steel deck flutes. "Picture Frame" installation method is not permitted.
- D. Apply roofing membrane with side laps shingled with roof slope, where possible.
- E. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane per manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - a. Remove and repair any unsatisfactory sections before proceeding with work.
 3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
- F. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- G. Induction Welding Installation:
1. Perform calibration and set-up as detailed by the Induction Welder Owner's Manual
 2. Center the Induction Welder over the first plate in pattern and activate the weld.
 - a. Induction Welder shall be centered over the plate to create a 100% bond.
 - b. If an error occurs during activation, refer to the induction welder owner's manual for corrective action.
 3. Prior to every use, clean face of Heat Sink Magnet.
 4. Place Heat Sink Magnet over the welded plate.
 - a. Keep Heat Sink Magnet in place at least 45 seconds while the assembly cools.
 5. Repeat process for each plate.

3.15 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply solvent-based bonding adhesive at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Apply water-based bonding adhesive in two-sided application, at required rate, and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

- D. Apply single ply liquid applied flashing system per manufacturer's written instructions.
- E. Flash penetrations and field-formed inside and outside corners per manufacturer's installation instructions.
- F. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- G. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.16 EDGE METAL INSTALLATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Provide edge details as indicated on the Drawings. Install in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."
- C. Join individual sections in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."

3.17 COATING INSTALLATION

- A. Ensure that all surfaces are clean, dry and free of any dirt, grease, oil or other debris that may interfere with proper adhesion.
- B. Apply coating to roofing membrane and base flashings as recommended by the manufacturer. Apply in two coats allowing the first coat to completely dry before applying the second coat.

3.18 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld and adhere walkway products to substrate according to roofing system manufacturer's written instructions.
- B. Roof-Paver Walkways: Install walkway roof pavers with applicable slip sheet according to manufacturer's written instructions in locations indicated, to form walkways.

3.19 FIELD QUALITY CONTROL

- A. Owner or designated representative will provide on-site observation and inspection during installation.
- B. Owner will engage a qualified testing agency to perform tests and inspections.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion and submit report to Architect.
- D. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.20 PROTECTION AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075419

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:

1. Ceramic tile floors. Tile flooring shall be firm, stable and slip resistant, CBC section 11B-302.1.
2. Ceramic tile base.
3. Ceramic tile wainscots.
4. Ceramic tile walls.
5. Marble threshold.

B. Related Work:

1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
2. Rough Carpentry: Section 06 10 00.
3. Gypsum Wallboard: Section 09 29 00.

1.02 SUBSTITUTIONS

Only written approval of the Architect will permit substitutions for materials specified; in accordance with Article 4-338, Title 24, Part 2, CCR.

1.03 QUALITY ASSURANCE

A. Standards: In general, Work shall conform to latest edition of the following standards as applicable, and as modified herein.

1. Installation: Tile Council of America, Handbook for Ceramic Tile Installation, latest edition.
2. Materials: Applicable ANSI standards, and Tile Council of America standards.

1.04 SUBMITTALS

A. Samples (minimum of 5): Manufacturer's standard color range.

B. Spare Tile: In addition to tile required for installation, Contractor shall furnish two (2) boxes of each color of floor tile and wall tile to the District Inspector for delivery to the District.

1.05 DELIVERY, STORAGE AND HANDLING

Deliver tile to Site in sealed containers with grade seals intact. Store materials in a dry location.

1.06 PROJECT CONDITIONS

Coordinate this work with work and backing furnished under other Specifications Sections.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Tile: Conform to ANSI A137.1 Standard Specifications for Ceramic Tile and Cove Base. Tile to be standard grade; manufactured by Dal-Tile Corporation; Dallas, TX; 800-933-8453, or approved equivalent.
 - 1. Ceramic Floor and Base (where specified) Tile: Unglazed porcelain paver abrasive; natural finish; cushioned edge.
 - a. Size:
 - 1) Floor Tile: 8" x 8 " x 1/4" .
 - 2) Cove Base: Same color as floor equal to Dal-Tile MB-5A where abutting a Wainscot and MB-5B (cushion edge) where abutting a non-tile finish.
 - b. Color: Match existing.
 - c. Coefficient of Friction: ASTM C1028-07e1. TILE SHALL BE SLIP RESISTANT
 - 1) Dry > 0.80
 - 2) Wet > 0.60
- 2. Ceramic Wall, Base (where specified) and Wainscot Tile (Field): Glazed interior tile; matte or gloss finish; cushioned edge; Color Wheel Collection, Classic:.
 - a. Size: 4-1/4" x 4-1/4" x 5/16" .
 - b. Color: Match existing.
 - c. Provide trim shapes as required, surface bull-nose typical at outside corners and top of wainscot, integral radius coves and square inside corners.
- 3. Ceramic Wall and Wainscot Tile (Accent): Glazed interior tile; gloss finish; cushioned edge; Color Wheel Collection, Classic.
 - a. Size: 4-1/4" x 4-1/4" x 5/16"
 - b. Color: Match existing.
- 4. Provide with ceramic tile trim sections including bullnose caps and corner sections.
- 5. Sanitary Ceramic Tile Base: DalTile 4-1/4" x 6" surface sanitary ceramic tile base or approved equivalent at all Janitors' Room and other areas with sealed concrete flooring.
- 6. Ceramic Tile at Floor Drain: Field cut and install 2" x 2" x 5/16" Porcelto tile at area near floor drains. Refer to Drawings for detail.

Color and pattern to be determined by Architect to match floor field tile. Install with uniformly wide grout joints.

- B. Portland Cement: ASTM C150/C150M-12, Type 1. White Portland Cement for grouting and pointing mortar, as follows:
 - 1. Dry-Set Portland Cement Mortar: Conform to ANSI A118.1.
 - 2. Latex-Portland Cement Mortar: Conform to ANSI A118.4.
- C. Sand: Washed; graded natural sand; durable; free from deleterious substance; conforming to ASTM C144-11.
- D. Water: Domestic source; clean and potable.
- E. Waterproofing Membrane: Noble Sheet Membranes or equivalent at all second floor toilets.
 - 1. Chloraloy: CPE (chlorinated polyethylene) resin sheet membrane for use under full mortar bed installations; nominal thickness 0.04". Membrane shall meet requirements of ASTM D4068-09.
 - 2. NobleSeal CIS: Composite sheet membrane manufactured from CPE (chlorinated polyethylene) resin with non-woven fabric laminated to both sides for use with thin-bed mortar bed; nominal thickness 0.03"; rated "Extra Heavy" in ASTM C627-10 (Robinson type floor tester).
 - 3. Join all sheets with seaming cement expressly made for these products by the manufacturer.
 - 4. Other acceptable manufacturers: Latricrete 9235.
- F. Hydrated Lime: High Calcium type; ASTM C206-03 (2009) or C207-06(2011), Type S.
- G. Color For Floor Tile Grout: Pure synthetic iron oxide; lime proof; non-fading mineral pigments; colors as selected by Architect from full color range including white and black.
- H. Grout: Latex - Portland Cement Grout; conforming with ANSI 118.6.
- I. Sealant: As specified in Section 07 92 00. Provide type of sealants as classified under ASTM C666/C666M-03(2008) and as recommended by the Tile Council of America.
- J. Portland Cement Backing Board: High density, cementitious, glass fiber reinforced, 1/2" thick; WonderBoard as manufactured by Glascrete Inc.; Seal Beach, CA; 800-282-8786, or approved equivalent.

- K. Mesh: Alkali-resistant 2" glass fiber mesh tape at cementitious backerboard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces scheduled to receive tile work. Report unsatisfactory conditions.
- B. Do not start work until unsatisfactory conditions are corrected. Starting work constitutes acceptance of surfaces.

3.02 INSTALLATION - GENERAL

- A. Tile Work: By skilled mechanics and in accordance with the applicable provisions of the Handbook for Ceramic Tile Installation, by Tile Council of America.
- B. Tile sizes that are based on metric dimensions shall have joint thicknesses adjusted to maintain "inch-module" dimensions as indicated on the drawings such 2" x 2", 8" x 8", 12" x 12" or others.
- C. Install Portland Cement backerboard in accordance with manufacturer's printed instructions. Use corrosion resistant, self-drilling, 8 gauge, wafer-head screws with countersinking ribs to prevent strip-out.

3.03 INSTALLATION OF TILE - PORTLAND CEMENT MORTAR BED

- A. Scope: Unless otherwise shown or specified, exterior and interior tile work to be installed with full Portland cement mortar bed.
- B. Ceramic Tile Floors:
 - 1. Mortar Bed: Full Portland cement.
 - 2. Bond Coat (One of the following):
 - a. Conventional Portland cement mortar per ANSI A108.1.
 - b. Dry-Set or Latex Portland cement mortars per ANSI A108.5.
 - 3. Grout: Mix 1 part sand, one part cement, or approved factory-prepared mix.
 - 4. Pattern: Refer to Drawings.
 - 5. Floor Drain: Conform to sloping concrete, finish floor at floor drain.

3.04 INSTALLATION OF TILE - THINSET

- A. Install mortar, tile and grout in accordance with manufacturer's instructions.
- B. Lay tile to pattern indicated on Drawings. Do not interrupt tile pattern through openings.

- C. Cut and fit tile, tight to penetrations through tile. Form corners and bases neatly.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- E. Sound tile after setting. Replace hollow sounding units.
- F. Allow tile to set for a minimum of 48 hours prior to grouting.
- G. Grout tile joints using commercial Portland cement grout.
- H. Apply sealant to junction of tile and dissimilar materials.
- I. Apply sealant to junction of tile and dissimilar materials in accordance with Section 07 92 00. Install in accordance with vertical and horizontal joint movements as recommended by the Tile Council of America, latest edition.
- J. Refer to drawings for tile at floor drains. Cut as required to provide neat, smooth slope to floor drain. Maximum joint width shall be 1/16".

3.05 CLEANING

- A. Protection: Protect finish hardware and adjacent materials' surfaces with Vaseline in cases where acid solutions are used.
- B. Cleaning: Upon completion of any portion of tile work, remove rubbish and unused materials incidental to the installation, and give the finished surfaces a thorough cleaning in an approved manner. Remove traces of cement and dust accumulations.
 - 1. Do not use acid solutions on glazed tile work.
 - 2. Mix acid solution where required to clean unglazed tile, in proportions of 10% muriatic (HCL) acid to 90% water. Rinse with clear water to eliminate the acid salts precipitating from interaction with the cement particles. Do not allow the acid solution to dry on the face of the tile.

END OF SECTION

PART 1 - GENERAL 2/13/18

1.01 SUMMARY

A. Work Included:

1. Surface preparation.
2. Complete application of paint to interior and exterior surfaces.
3. Application of finish coats to shop-primed metal surfaces.
4. Surface finish schedule.

B. Related Work:

1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
2. Materials and items which receive: Respective Sections.
3. Factory finished items: Respective Sections.

C. Definitions:

1. DFT: Abbreviation for dry film thickness. The minimum thickness to be applied.
2. Paint: A collective general reference to include materials of every component for finishing systems of every type, and preparation of surfaces for and application of said materials.
3. Rough-Surface Wood: Rough-sawn, re-sawn, or sandblasted woods.

1.02 SUBSTITUTIONS

Only written approval of the Architect, will permit substitutions for materials specified. Refer to Sections 01 25 13 - Product Options and Substitutions.

1.03 QUALITY ASSURANCE

- A. Applicator: Company specializing in commercial painting and finishing with five (5) years experience, and approved by paint manufacturer.
- B. Products shall be V. O. C. compliant with local authorities, South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, current version.
- C. Regulatory Requirements: Conform to applicable code for flame/fuel/smoke rating requirements for finishes.

1.04 SUBMITTALS

- A. Submit according to the provisions of Section 01 33 00.
- B. **All paint must be purchased from the same store, Vista Paint, 173 Village Court, San Dimas, CA 91773.**

C. Samples:

1. Number Required: Three each.
2. Paints and Enamels:
 - a. Typical: Each type, in each selected color; 8" x 10" size on stiff smooth material typical; on sandpaper for rough surfaces.
 - b. Stipple Enamel: Each selected color Architect approved, roller texture on 12" x 24" piece of drywall.
3. Stains, Varnishes, Lacquers: Each finish type on each specie and texture of wood; 8" x 10" size for plywood, 16" length for casing or boards, show clearly each step of finishing process.
4. Make samples by same methods to be used to produce actual work. Samples will be examined for color, texture, and workmanship.
5. Remake and resubmit samples when required for approval.

D. Product Data: Complete list of paint materials including compliance with South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, current version; Safe Drinking Water and Toxic Enforcement Act of 1986; Proposition 65, OEHHA.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in sealed containers with manufacturer, brand name, product, and use instructions clearly identified.
- B. Store paint materials at minimum ambient temperature of 45°F and a maximum of 90°F, in well-ventilated area, unless required otherwise by manufacturer's instructions.
- C. Handle to prevent damage during storage and use.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements:
 1. Follow manufacturer's printed recommendations for product when they are more stringent than limits stated herein.
 2. Do not apply materials when temperature is below 50°F or above 110°F.
 3. Do not apply materials when RH is above 90%.
 4. Provide continuous ventilation as necessary to provide air movement, aid drying, and disperse noxious fumes.
 5. Do not apply paint to wet-applied construction until such work is dry, and acceptable to Architect and paint manufacturer.

6. Do not apply exterior paint in rainy, damp, misty, smoggy, or excessively windy weather.
 7. Do not apply paint in areas where dust is being generated.
 8. Provide lighting level of 80 foot-candles measured mid-height at substrate surface during application.
- B. Protection:
1. Cover or otherwise protect finished work of other trades, work not to be painted concurrently, landscaping, and adjacent property from damage.
 2. When not in use, store paints in designated areas. Keep containers closed. At end of day's work, remove empty containers, paint soaked rags, and debris. Vent fumes. Take precautions to prevent fire.
- C. Sequencing, Scheduling:
1. Coordinate removal and replacement of hardware, electrical fixtures and trim, and related work of other Sections.
 2. Stain, prime, back paint, and pre-finish items before installation as required.
- D. Do not use Project plumbing fixtures or piping systems for the following:
1. Cleaning painting equipment and utensils.
 2. Disposal of waste from cleaning or disposal of paints.

1.07 EXTRA MATERIALS

- A. Provide a one-gallon container of each color and surface texture to Owner.
- B. Label each container with color, texture, and room locations, in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers shall verify that their products conform to latest California Air Resources Board regulations.
- B. Materials used in the work of this Section shall be a proprietary brand of one of the following, unless otherwise specified below.
1. **Vista Paint Corporation: 2021 E. Orangethorpe, Fullerton, CA 92831 714-680-3810.**(Preferred Manufacture)

2. ICI Dulux Paints (Ameritone, Glidden, Sinclair); Cleveland, Ohio 800-984-5444.
3. Dunn-Edwards Corp.; Los Angeles, CA; 800-733-3866.

C. Substitutions: Under provisions of Section 01 25 13.

2.02 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Metal Primers:

1. Rust-Inhibitive Primer (For Ferrous Metals):
 - a. Protec Metal Prime (red)9610, Vista Paint Corporation.
 - b. Bloc-Rust Red Oxide Primer 43-4, by Dunn-Edwards.
 - c. Red Oxide Metal Primer #54, by Ameritone.
 - d. Alkyd Metal Primer #4100, by Glidden.
2. General Primer (For Ferrous Metals):
 - a. Protec Metal Prime 9600, Vista Paint Corporation
 - b. Corrobar White Alkyd Primer 43-5, by Dunn-Edwards.
 - c. Devguard 4160, by Devoe.
3. Aluminum and Galvanized Metal Primer (For Non-Ferrous Metals):
 - a. Metal Pro Primer 4800, Vista Paint Corporation.
 - b. Galv-Alum Primer 43-7, by Dunn-Edwards.
 - c. Devguard 4120, by Devoe.
 - d. Coor-Tect #34, by Sinclair.

B. Wood Primers and Sealers:

1. Water-Base Primer (Exterior & Interior):
 - a. Uniprime 4000, Vista Paint Corporation
 - b. E-Z Prime, W708, by Dunn-Edwards.
 - c. 2000-1200 Primer, by ICI Paints.
2. Alkyd Primer (Exterior & Interior):
 - a. Prime-ZALL 8000, Vista Paint Corporation
 - b. Cover-Stain Primer, 03500 Series, by Zinsser.
 - c. Kilz Oil-Base Primer Sealer by Masterchem Industries.
3. Pigmented Shellac Primer: Bin Shellac Base Primer Sealer, by Zinsser.
4. Sanding Sealer: MC80-6200 (McCloskey), by Vista Paints Corporation.

C. Masonry Fillers and Sealer:

1. 100% Acrylic Block Filler 018, Vista Paint Corporation
2. Standard Concrete Block Filler: Bloc-Fil W305, by Dunn-Edwards.
3. Heavy Concrete Block Filler: Bloc-Fil W305, by Dunn-Edwards.

- D. Latex Enamel Paints:
 - 1. Acrylic Latex Enamel - Semi-Gloss:
 - a. Carefree Semi-Gloss 8400 / Protec Gloss 9900 Vista Paint Corporation.
 - b. Permasheen W901-1, by Dunn-Edwards.
 - c. Dulux Professional Exterior 100% Acrylic, by ICI Paints.
 - 2. Exterior Masonry
 - a. Semi-Gloss, 8400 Vista Paint Corporation.
 - b. Evershield W701-1, by Dunn-Edwards.
 - c. Masonry Flat Finish, 2220, by ICI.
- E. Polyurethane Coatings:
 - 1. Polytec Clearcoat 87C, Vista Paint Corporation
 - 2. Water-Base Polyurethane, Satin Finish:
 - a. MC8-6841 (McClosky 6841 Series), by Dunn-Edwards.
 - b. 1802, by ICI Paints.
 - 3. Deftthane Polyurethane Oil Base, Deft.
 - 4. Solvent-Base Polyurethane, Gloss Finish: Interthane 990HS, by International Protective Coatings, Houston, TX: 713-682-1711.
- F. Polytec Gloss 8900, Vista Paint Corporation.
 - 1. Solvent-Base Epoxy Paint: Interseal 670HS, by International Protective Coatings, Houston, TX; 713-682-1711.
- G. Fence Primer and Paint:
 - 1. Galvanized Chain Link Posts and Fencing and Wire Fabric.
 - a. Polytec Primer, 8600
 - b. Protec Satin 9700
 - 2. Prefinished Decorative Metal Fence
 - a. Polytec Primer, 8600
 - b. Protec Semi-Gloss 9800

2.03 MATERIALS

- A. Each material type to be same manufacturer throughout. Materials in a coating system to be by a single manufacturer.
- B. Ready mixed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
- C. Coatings shall have good flow and brushing properties; capable of drying or curing free of streaks or sags.

- D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.04 MIXES

- A. Follow manufacturer's printed recommendations.
- B. Mix paints thoroughly prior to application.
- C. Mix only in Inspector's presence, in assigned spaces.
- D. Except where thinning is specifically recommended by manufacturer, do not thin products.

2.05 FINISHES

- A. Refer to schedule at end of Section for surface finish schedule.
- B. Colors:
 - 1. As selected by Architect, from Manufacturer's standard and custom colors and finish selection charts.
 - 2. A number of colors (8 minimum to 12 maximum) will be selected, arranged in various combinations, used to accent trim and other architectural features, and colors and combinations will vary from exterior-to-interior, space-to-space, surface-to-surface, material-to-material, and feature-to-feature.
 - 3. Colors to be factory mixed, and to match approved samples.
 - 4. Tint undercoats sufficiently different so they are readily distinguishable, in any light, from each other and the finish coat.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces for suitability to receive paint. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Plaster and Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.
4. Exterior Located Wood: 19 percent, measured in accordance with ASTM D2016.
5. Concrete Floors: 7 percent.

D. Beginning of installation means acceptance of existing surfaces.

3.02 PREPARATION - NEW SURFACES

A. General:

1. Remove all manufacturer's labels, tags, electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
2. All specified products are to be stored, handled, and used per manufacturer's printed instructions and recommendations.
3. Correct all surface defects, which may adversely affect the finished work.
4. Clean all surfaces prior to sealer or primer application. Surfaces to be free of all loose coating, dust, corrosion and other foreign matter.

B. Metal:

1. Shop Primed Structural Steel:
 - a. Thoroughly clean all surfaces utilizing SSPC-SP No. 2 Hand Cleaning or SSPC-SP No. 3 Power Brush Cleaning method.
 - b. Sand all rough areas to provide smooth, uniform surface. Spot prime abraded, damaged, and unprimed areas with Rust Inhibitive Primer.
2. Shop Primed Non-Structural Steel:
 - a. Thoroughly clean all surfaces.
 - b. Sand all rough areas to provide smooth, uniform surface. Spot prime abraded, damaged, or unprimed areas with Rust Inhibitive Primer.
3. Galvanized Steel:
 - a. Thoroughly clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
 - b. Etch all surfaces with application Krud Kutter Metal Etch Distributed by Vista Paint Corporation solution as follows. Thinning: Use water. Do not reduce solution beyond three parts water to one part Galv-Etch. Application: Brush or mop apply in a thin even coat. After five minutes, remove excess solution with rags, squeegee or sponge. Drying Time: 1/2 hour minimum and 4 hours maximum before priming.
4. Galvanized Chain Link Fence:

- a. Thoroughly power wash and clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
 - b. Lightly sand posts.
 5. Drinking Fountain Steel Pipe Guardrails (Powder Coating): Chemical conversion coating or sand blast all surfaces per Powder Coating manufacturer's printed guidelines.
- C. Wood Work:
 1. Painted Wood:
 - a. Thoroughly clean all surfaces.
 - b. Seal knots, pitch spots and resinous areas with Pigmented Shellac Primer.
 - c. Fill all nail and screw holes, open joints, cracks and defects with putty. Install putty after prime coat application. Spot prime all fill areas with Water-Base Primer at exterior locations and Alkyd Primer at interior locations.
 - d. Except for rough sawn lumber and plywood, sand surfaces to a smooth, uniform finish with No. 150 grit sand paper.
 2. Wood with Transparent Finish:
 - a. Thoroughly clean all surfaces.
 - b. Fill all nail and screw holes, open joints, cracks and defects with putty. Putty color to match final finish color.
 - c. Sand to a smooth, uniform finish with No. 220 grit sand paper.
 2. Thoroughly clean all surfaces per coating manufacturer's printed requirements.
- D. Factory Finished Products and Equipment:
 1. Remove all incidental adhesive applied labels and label adhesive. Equipment information and data labels and plates to remain.
 2. Thoroughly clean all surfaces with mineral spirits.
 3. Dull glossy paint surfaces by sanding or application of liquid de-glossing surface conditioner.
- E. Factory Finished Decorative Metal Fence:
 1. Thoroughly clean all surfaces with mineral spirits.
 2. Dull glossy paint surfaces by sanding or application of liquid de-glossing surface conditioner.
- F. Mildew Treatment: If mildew is present, treat mildew area with spray-on solution of 50% bleach and 50% water. Let surface dry. Spot prime area with Alkyd Primer.
- G. Removal of Grease, Oil and Other Contaminants: Remove oil, grease and similar type contaminants with mineral spirits, ammonia-based

cleaners or trisodium phosphate (TSP) solution. Provide adequate ventilation during use. Allow surfaces to dry prior to primer application.

3.03 PREPARATION - EXISTING SURFACES

A. General:

1. Remove all electrical plates, hardware, light fixture trim and fittings prior to preparing surfaces or finishing.
2. Correct all surface defects which may adversely affect the finished work.
3. Clean all surfaces prior to primer or finish application. Surfaces to be free of all dust, corrosion and other foreign matter.
4. Refer to Paragraph 3.02 for preparation of existing construction not previously finished.

B. Metal:

1. Painted Iron and Steel:
 - a. Power wash all exterior surfaces. Thoroughly clean all interior surfaces.
 - b. Remove all loose, peeling or chalky paint and rust by scraping, hand brushing, power brushing, sanding and/or grit blasting to expose bare metal. Smooth exposed paint edges by sanding. Spot prime exposed metal surfaces with Rust Inhibitive Primer or General Metal Primer. Spot prime exposed galvanized surfaces with Galvanized Metal Primer. Primers to be applied same day that metal is exposed.
 - c. At depressions and dents in steel hollow metal doors, door frames and window frames sand area completely and fill depression or dent with body filler. Prime body filler areas with Rust Inhibitive Primer or General Metal Primer.
 - d. Sand all rough areas to provide smooth, uniform surface. Dull glossy paint surfaces by sanding or application of liquid deglossing surface conditioner.
2. Galvanized Steel/ Chain Link Fencing and Wire Fabric Posts:
 - a. Thoroughly power wash and clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
 - b. Etch all surfaces with application Krud Kutter Metal Etch Distributed by Vista Paint Corporation solution as follows. Thinning: Use water. Do not reduce solution beyond three parts water to one part Galv-Etch. Application: Brush or mop apply in a thin even coat. After five minutes, remove excess solution with rags, squeegee, or sponge. Drying Time: 1/2 hour minimum and 4 hours maximum before priming.
3. Pre-Finished Decorative Metal Fence:

- a. Thoroughly power wash and clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
 - b. Etch all surfaces with application Krud Kutter Metal Etch Distributed by Vista Paint Corporation solution as follows. Thinning: Use water. Do not reduce solution beyond three parts water to one part Galv-Etch. Application: Brush or mop apply in a thin even coat. After five minutes, remove excess solution with rags, squeegee, or sponge. Drying Time: 1/2 hour minimum and 4 hours maximum before priming.
 4. Aluminum: Thoroughly clean all surfaces.
- C. Wood Work:
1. Painted Wood:
 - a. Power wash all exterior surfaces. Thoroughly clean all interior surfaces.
 - b. Remove all loose, peeling or chalky paint by scraping and/or sanding. Smooth paint edges and remove weathered wood to expose sound wood surface by sanding. Spot prime exposed wood areas with Water-Base Primer at exterior locations and Alkyd Primer at interior locations.
 - c. Fill all holes, scratches, depressions, and cracks with putty.
 - d. Sand all rough areas to provide smooth, uniform surface. Dull glossy paint surfaces by sanding or application of liquid deglossing surface conditioner.
 2. Wood with Varnish or Lacquer Finish to be Painted (Interior):
 - a. Thoroughly clean all surfaces.
 - b. Fill all holes, scratches, depressions, and cracks with putty.
 - c. Sand all rough areas to provide smooth, uniform surface. Sand all surfaces with No. 150 grit sand paper.
 3. Wood with Varnish or Lacquer Finish to be Re-Coated (Interior):
 - a. Thoroughly clean all surfaces.
 - b. Repair all damaged areas.
 - c. Fill all holes, scratches, depressions, and cracks with putty. Color of putty to match wood color.
 - d. Sand all rough areas to provide smooth, uniform surface. Sand all surfaces with No. 220 grit sand paper.
 4. Deteriorated, Rotted or Insect Damaged Wood: Replace all deteriorated, rotted, and insect damaged wood with wood type matching existing wood. Refer to Section 06 10 00 - Rough Carpentry and Section 06 20 00 - Finish Carpentry for replacement wood requirements. Prepare replacement wood per Paragraph 3.02, C.

- I. Mildew Treatment: If mildew is present treat mildew area with spray-on solution of 50% bleach and 50% water. Let surface dry. Spot prime area with Alkyd Primer.
- J. Removal of Grease, Oil, and Other Contaminants: Remove oil, grease and similar type contaminants with mineral spirits, ammonia-based cleaners or trisodium phosphate (TSP) solution. Provide adequate ventilation. Allow surfaces to dry prior to primer application.

3.04 PROTECTION

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

3.05 APPLICATION

- A. Workmanship:
 - 1. Execute work with skilled craftsmen.
 - 2. Evenly apply coats, with suitable equipment, well flowed on, free of laps, runs, skips, dead spots, and other imperfections. Last coat to present a uniform surface, color, and texture.
 - 3. Stipple texture to be as approved by Architect.
 - 4. Apply products in accordance with manufacturer's instructions if more stringent than limits specified herein.
 - 5. Do not apply finishes to surfaces that are not dry.
- B. Equipment: Brushes, rollers, and spraying equipment as required and suitable for material being applied; keep clean and in proper operating condition. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- C. General:
 - 1. Paint and color areas per Architect's Color Schedules.
 - 2. All existing wood surfaces to be sanded prior to painting.
 - 3. Mask and cut-in as required to accomplish the various color combinations. Make edges of paint clean and sharp (no overlaps) where they adjoin other colors or materials.
 - 4. Mask all casework hardware.

5. Paint entire surfaces, parts, and items including reveals, returns, rabbets, soffits, projections, openings, and ornamental features.
 6. Allow applied coat to dry within paint manufacturer's recommended limits before next coat is applied.
- D. Number of Coats:
1. Specified number is the minimum number to be applied.
 2. Contractor shall, at his expense, apply additional coats as directed by Architect if:
 - a. Contractor does not produce full even coverage.
 - b. Contractor does not meet required dry film thickness with specified number of coats.
 - c. Contractor applies a coat before Inspector has examined previous coat.
- E. Dry Film Thickness stated in Schedule of Paint Finishes must be increased to manufacturer recommended thickness when such exceeds the thickness stated herein.
- F. Minimum drying time between coats shall be the most stringent of the following conditions:
1. Until coat is dry.
 2. Manufacturer's printed recommendations.
 3. Three (3) days for exterior work, two (2) days for interior work, except where other time requirements are specifically stated in manufacturer's printed recommendations.
- G. Preparation Work Between Coats: Prepare each coat to receive succeeding coat.
1. General: Repair defects, sand, dust, wipe clean.
 2. Wood, Enameled: When dry, lightly sand smooth.
 3. Wood, Varnished or Lacquered: When dry, steel wool smooth.
 4. Plaster and Concrete: Neutralize suction spots or hot spots; then touch-up so coat surface is uniform.
- H. Back-Priming:
1. Immediately upon delivery to Project site, back prime surfaces which will be concealed after installation for following items: Exterior and interior finish lumber and millwork, doorframes, trim, plywood wall lining and paneling.
 2. Painted and Enameled Work: One coat clear sealer.
 3. Wood with Stained Finish: One coat linseed oil.
 4. Keep back-priming off exposed faces.

- I. Priming:
 - 1. General: Prime work as soon as possible after surfaces are prepared.
 - 2. Ungalvanized Steel: Prime immediately after cleaning, on the same day.
 - 3. Galvanized Sheet Metal: Prime immediately after erection.
 - 4. Exterior and Interior Woodwork: Prime immediately after erection.
 - 5. At Glazing: Paint glass beads, stops and rabbets, except for aluminum.
- J. Application Methods: Apply by brush or roller, except as listed below.
 - 1. Enamel to Doors: Roller only.
 - 2. Enamel: Roller typically.
 - 3. Stipple Enamel: Roller only, with Architect approved texture.
 - 4. Varnish or Lacquer: Spray.
 - 5. Exterior Wood Stains: Apply by brush or roller only. Work well into surface, especially on rough-surface woods.
 - 6. Chain Link Fence: Spray.
 - 7. Decorative Metal Fence: Spray.
- K. Doors: Finish faces, edges, top, and bottom. On wood doors, apply first coat to all parts at the same time. At exterior doors, paint interior face with same material used on the exterior face.
- L. Colors: Make color changes at inside corners typically. Paint to a clean straight line.

3.06 PAINTING OF MECHANICAL AND ELECTRICAL ITEMS AND EQUIPMENT

- A. Painting of factory finished items and equipment is not required unless specifically called out herein or on the drawings.
- B. Paint the following:
 - 1. Interior exposed mechanical pipes ductwork, hangers, brackets, collars, and supports.
 - 2. Interior surfaces of ductwork that are visible through grilles, registers, and louvers. Paint flat black. Paint exposed to view dampers behind grilles, registers, and louvers to face grilles, register, or louver color.
 - 3. Exposed plumbing piping, hangers, fasteners, and supports visible from the ground.
 - 4. Interior exposed electrical conduit, boxes, hangers, fasteners, and supports visible from the ground.

5. Electrical panel and telephone backboards. Paint both sides and all edges of backboards. Painting to occur prior to equipment installation.
 6. All unfinished mechanical and electrical items and equipment.
 7. All primed mechanical and electrical items and equipment.
- C. Do not paint equipment nameplates, identification information, and/or labels.
- D. Refer to Division 15 for pipe identification requirements.

3.07 FIELD QUALITY CONTROL

- A. Notify Inspector of Record (IOR) when work is ready for examination. Examination of work shall occur at the following stages:
1. Surface preparation, prior to application of prime coat.
 2. Each coat, prior to application of succeeding coat.
 3. Final coat, and finished work.
- B. Do not proceed with next operation until required examination has been made.

3.08 ADJUSTING AND CLEANING

- A. Cleaning:
1. Clean surfaces as work progresses.
 2. Remove paint spillage and droppings, and stains promptly.
 3. Do not use tools or cleaners, which will mar finish of item being cleaned.
 4. Leave work and paint storage area clean and free of unnecessary accumulation of tools, equipment, surplus materials, and debris resulting from this work.
- B. Correction of Defective Work:
1. Repair abraded, damaged, or incomplete paint surfaces by methods acceptable to Architect. Spot repairs to be well blended into adjacent work. For large repairs, re-coat entire plane or building element in which damaged area occurs.
 2. Defaced surfaces of work not to be painted, shall be cleaned and their original finish restored.
- C. Collect cotton waste, cloths, and material, which may constitute a fire hazard. Place in closed metal containers and remove daily from site.

3.09 SCHEDULE OF PAINT FINISHES - NEW SURFACES

- A.. Metal:

1. Shop Primed Structural Steel (Exposed on Building Exterior):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
2. Shop Primed Structural Steel (Exposed on Building Interior):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
3. Shop Primed Non-Structural Steel (unless noted otherwise):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
4. Shop Primed Metal Doors:
 - a. Coat 1: Acrylic Latex Enamel, Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Gloss.
 - c. Total DFT: 3.0 mils.
5. Shop Primed Metal Door Frames:
 - a. Coat 1: Acrylic Latex Enamel, Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Gloss.
 - c. Total DFT: 3.0 mils.
6. Galvanized Metal:
 - a. Coat 1: Galvanized Metal Primer. Apply Coat 1 within 4 hours of preparation work completed.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
 - d. Total DFT: 5.0 mils.
7. Galvanized Chain Link Fence:
 - a. Coat 1: Multi-Purpose Primer.
 - b. Coat 2: Alkyd Polyurethane, Satin
 - c. Coat 3: Alkyd Polyurethane, Satin
 - d. Total DFT: 3.0 mils.
8. Factory Finished Products and Equipment (See Respective Specification Sections).
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
9. Factory Finished Decorative Metal Fence:
 - a. Coat 1: Multi-Purpose Primer.
 - b. Coat 2: Alkyd Polyurethane, Satin.
 - c. Coat 3: Alkyd Polyurethane, Satin.
 - d. Total DFT: 3.0 mils.
10. Visible Roof-Top Equipment: Paint per requirements of Factory Finished Products and Equipment or per Metal type.

11. Gas Piping:

- a. Coat 1: Rust Inhibitive Primer.
- b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
- c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
- d. Total DFT: 5.0 mils.

B. Wood Work:

1. Wood Work (Exterior):

- a. Coat 1: Alkyd Primer.
- b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
- c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
- d. Total DFT: 4.5 mils.

2. Millwork (Interior, Paint Finish):

- a. Coat 1: Alkyd Primer:
- b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
- c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
- d. Total DFT: 4.5 mils.

3. Doors and Door Frames (Interior, Paint Finish):

- a. Coat 1: Alkyd Primer:
- b. Coat 2: Acrylic Latex Enamel, Gloss.
- c. Coat 3: Acrylic Latex Enamel, Gloss.
- d. Total DFT: 4.5 mils.

4. Doors, Casework, and Millwork (Interior, Transparent Finish):

- a. Coat 1: Oil Stain.
- b. Coat 2: Sanding Sealer, Light sand with No. 220 sand paper.
- c. Coat 3: Water-Base Polyurethane, Satin.
- d. Coat 4: Water-Base Polyurethane, Satin.
- e. Total DFT: 3.0 mils.

5. Painted Plywood Back Board at Electrical Equipment:

- a. Coat 1: Fire Retardant Coating. 150 SF per gallon.
- b. Coat 2: Fire Retardant Coating, 150 SF per gallon.

3.10 SCHEDULE OF PAINT FINISHES - EXISTING SURFACES

A. General:

- 1. Refer to Paragraph 3.09 for required paint finishes on existing unpainted materials, products and equipment.
- 2. Existing surface mounted conduit and electrical boxes on surfaces called out to be painted are to be painted also.
- 3. Existing air distribution diffusers and returns on surfaces called out to be painted are to be painted also.

B. Metal:

1. Previously Painted Steel:
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
 2. Previously Painted Metal Doors:
 - a. Coat 1: Acrylic Latex Enamel, Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Gloss.
 - c. Total DFT: 3.0 mils.
 3. Previously Painted Metal Door Frames:
 - a. Coat 1: Acrylic Latex Enamel, Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Gloss.
 - c. Total DFT: 3.0 mils.
 4. Galvanized Metal:
 - a. Coat 1: Galvanized Metal Primer. Apply Coat 1 within 4 hours of Preparation work completion.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
 - d. Total DFT: 5.0 mils.
 5. Galvanized Chain Link Fence:
 - a. Coat 1: Multi-Purpose Primer.
 - b. Coat 2: Alkyd Polyurethane, Satin
 - c. Coat 3: Alkyd Polyurethane, Satin
 - d. Total DFT: 3.0 mils.
 6. Aluminum:
 - a. Coat 1: Aluminum Primer.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss. Apply Coat 2 within 48 hours of Primer application.
 - c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
 - d. Total DFT: 5.0 mils.
 7. Factory Finished Decorative Metal Fence
 - a. Coat 1: Multi-Purpose Primer.
 - b. Coat 2: Alkyd Polyurethane, Semi-Gloss
 - c. Coat 3: Alkyd Polyurethane, Semi-Gloss
 - d. Total DFT: 3.0 mils.
- C. Wood Work:
1. Previously Painted Items (Exterior):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
 2. Previously Painted Casework, and Millwork (Interior):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
 3. Previously Painted Door and Door Frames (Interior & Exterior):

- a. Coat 1: Acrylic Latex Enamel, Gloss.
- b. Coat 2: Acrylic Latex Enamel, Gloss.
- c. Total DFT: 3.0 mils.
- 4. Previously Varnished or Lacquer Finished Casework and Millwork (Interior to be Painted):
 - a. Coat 1: Alkyd Primer.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
 - d. Total DFT: 4.0 mils.
- 5. Previously Interior Transparent Finished Doors, Casework, and Millwork (Re-Coat):
 - a. Coat 1: Water-Base Polyurethane, Satin.
 - b. Coat 2: Water-Base Polyurethane, Satin.
 - c. Total DFT: 2.0 mils.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work may include the following signs, refer to Drawing for signage requirements:
 - 1. Plastic Signs:
 - a. International accessibility symbol signs.
 - b. Room capacity signs.
 - c. Exit signs, unlighted.
 - d. Room identification signs.
 - 2. Metal Signs:
 - a. International accessibility symbol signs.
 - b. Accessible parking entrance signs.
- B. Related Work:
 - 1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.

1.02 SUBSTITUTIONS

Only written approval of Architect, by Addenda or Change Order, will permit substitutions for materials specified. Refer to General Conditions and Section 01 25 13 - Product Options and Substitutions for procedure.

1.03 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies; Codes:
 - 1. State Fire Marshal, Title 19.
 - 2. California Building Code current Edition (CBC).
 - a. All signage shall conform to CBC Sections 11B-703.
 - b. Tactile exit signage shall be provided per current CBC Section 1011.4.
 - 3. Conform to State Regulations for standard Accessibility sign.
 - 4. Refer to Drawings for additional standards and graphics.

1.04 DESIGN REQUIREMENTS

Signage and graphics:

Raised characters shall comply with **CBC Section 11B-703.2**:

- **Depth:** It shall be 1/32 inch (0.8 mm) minimum above their background and shall be sans serif uppercase and be duplicated in Braille.
- **Height:** It shall be 5/8 inch (15.9 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter "I". **CBC Section 11B-703.2.5**
- **Finish and contrast:** Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background. **CBC Section 11B-703.5.1**
- **Proportions:** It shall be selected from fonts where the width of the uppercase letter "O" is 60 % minimum and 110 % maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15 % maximum of the height of the character. **CBC Sections 11B-703.2.4 and 11B-703.2.6**
- **Character Spacing:** Spacing between individual raised characters shall comply with **CBC Section 11B-703.2.7 and 11B-703.2.8**
- **Format:** Text shall be in a horizontal format. **CBC Section 11B-703.2.9**

- **Braille:** It shall be contracted (Grade 2) and shall comply with **CBC Sections 11B-703.3 and 11B-703.4**. Braille dots shall have a domed or rounded shape and shall comply with **CBC Table and Figure 11B-703.3.1**.
- **Mounting height:** Tactile characters on signs shall be located 48" minimum to the baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. **CBC Section and Figure 11B-703.4.1**
- **Mounting location:** A tactile sign shall be located per **CBC Section and Figure 11B-703.4.2** as follows:
 - alongside a single door at the latch side.
 - on the inactive leaf at double doors with one active leaf.
 - to the right of the right hand door at double doors with two active leaves.
 - on the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leaves.
 - so that a clear floor space of 18" x 18" minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

- B. Type Imagery:
1. Type style: Sans Serif upper case.
 - a. Letter Size: See signage drawings.
 - b. Number Size: See signage drawings.
 - c. Raised Letters: Letters shall be raised a minimum of 1/32" above background.
 - d. Other Sizes: As specifically indicated.
 2. Arrangement: Use standard spacing between letters, words, numbers and lines; center text.
- C. Symbol Style: Recognized standard International Symbols of Accessibility, such as those developed by the American Institute of Graphics, for the U. S. Department of Transportation.
1. Accessible Restrooms shall include a 6" high wheelchair logo. Logo shall be raised a minimum of 1/32" above the background.
 2. On visual signs, characters and symbols shall be sized according - to view distance. Signs mounted 80" or more AFF shall have minimum 3" high characters.
 3. Pictographs and ISA's (International Symbol of Accessibility) on interior signs at eye level, shall be minimum 3 " high or twice as high as the height of text on the sign; whichever is greater. On signs where bottom is 72" or more AFF, minimum height shall be 6" or twice as high as the largest text on the signs; whichever is greater.
- D. Colors:
1. Background Colors: As selected by the Architect from manufacturer's standard color range (12 colors maximum); one color maximum, typically.
 2. Type Imagery: White or black, as selected by Architect to contrast with background colors; one color maximum, each, for interiors and exteriors.

3. Code Required Colors for Symbols and Signs: Where colors are mandated by Codes or Regulations conform to their requirements.
4. Other colors: Certain colors are specifically noted.

1.05 SUBMITTALS

- A. Samples: Provide full-size, with colors, materials, graphics and type imagery as specified herein. Provide one sign of each type, for approval by the Architect.
- B. Product Data: Four (4) copies of manufacturer's standard brochure describing all items and materials, including manufacturer's standard color range.
- C. Shop Drawings: Reference shop drawings to Architect's Drawings and mark numbers. Shop drawings shall list sign styles, lettering and locations. Submit four (4) copies.

1.06 PROJECT CONDITIONS

- A. Verify type of supporting construction; provide suitable attachments.
- B. Room Identification Signs: Coordinate with installation of other door-mounted identifying devices.
- C. Do not install adhesive applied signs when ambient temperature is below 70°F. Maintain this minimum during and 24 hours after, installation of signs.

PART 2 - PRODUCTS

2.01 PLASTIC SIGNS

- A. Manufacturers:
 1. SIGNS and Lucite Products, Inc.: 2721 Kimball Avenue, Pomona, CA 91767; (909) 621-7447.
 2. Acceptable Manufacturers:
 - a. Architectural Sign/Identity, 1247 South Buena Vista St., San Jacinto, CA 951-654-4350.
 - b. Best Manufacturing, Montrose, Colorado; 800-235-2378.
 - c. Mohawk Sign Systems Inc.; P.O. Box 966, Schenectady, NY 12301; 800-223-7708 or approved equivalent.
- B. Materials:
 1. Plastic Sign Material:
 - a. Type: Phenolic Resin Core with a three-ply melamine resin surface.
 - b. Thickness: 1/8".
 2. Adhesive: Pressure sensitive, hi-tack transfer tape with peel-back paper backing. Structural grade silicone adhesive for mounting on glazing.
 3. Mounting Screws: Non-corrosive, tamperproof screws. Match finishes to the door hardware for the door where the signs are mounted.
 4. Signs shall be non-static, fire retardant, and self-extinguishing.

- C. Manufacturing Specifications:
1. Material thickness: 1/8".
 2. Standard sheet size: 48" x 96".
 3. Weight: 1/8" = 1 lb/ square foot.
 4. Maximum continuous operating temperature: 225°F (107°C).
 5. Flexural strength flat: 21,497 psi.
 6. Tensile strength: 22,000 psi.
 7. Shear strength: 22,729 psi.
 8. NEMA rated "self-extinguishing".
- D. Graphic Process and Fabrication: All signs shall be manufactured using "Sand-Etched Process" or equivalent system, as per acceptable manufacturers stated methods, whereby characters are integral part of signage body.
1. Tactile characters shall be raised the required 1/32" from sign face. Glue-on letters, images and/or symbols are not acceptable.
 2. Work to have sharp clean profiles.
 3. Text shall be accompanied by Contracted Grade 2 Braille. Braille shall be separated 3/8" min. and 1/2" max. from corresponding raised characters or symbols.
 4. Perimeter borders shall be 3/8" minimum.
 5. Edges: Finish edges smooth and clean, without chips or burrs.
 6. Corners: Provide radius corners; 1/8" diameter.
 7. Cut-outs For Hardware: Factory made, accurately, to templates.
 8. Mounting Holes: Factory drilled.
 9. Adhesive Backing: Completely cover rear surface of each sign.
- E. Room Identification Signs:
1. Refer to Drawings for names, numbers, identification symbols, sizes, configurations, and locations.
 2. Colors for Type Imagery:
 - a. Room Name Signs:
 - 1) Type: Black or white, to be selected by Architect.
 - 2) Background: One color to be selected by the Architect from manufacturer's standard color range (12 colors, minimum) for interior signs, unless otherwise noted. Refer to signage schedule.
 - b. Room Number Signs:
 - 1) Type: Black or white, to be selected by Architect.
 - 2) Background: One color to be selected by the Architect from manufacturer's standard color range (12 colors, minimum) for interior signs, unless otherwise noted. Refer to signage schedule.
 - c. Architect shall select a second color for signs located on exterior.

F. Accessibility Symbol Signs:

1. Refer to Drawings for identification symbols, sizes, configuration, and locations.
2. Figure Symbols for Building Entrance Signs:
 - a. Size: 6" x 6", typically.
 - b. Refer to Drawings.
3. Geometric Symbols for Toilet Rooms:
 - a. For Men/Boys: An equilateral triangle, 10" on a side; 1/8" thick.
 - b. For Women/Girls: A 12" diameter circle; 1/8" thick.
 - c. For Both Sexes: An equilateral triangle, 10" on a side, inlaid in 12" diameter circle; 1/8" thickness.
4. Directional Signs.
5. International Symbol for Access for the hearing impaired.
6. Colors for Symbols:
 - a. International Accessibility Symbols:
 - 1) Symbols: White.
 - 2) Background: Blue, Color No. 15090 per Federal Standard 595B.
 - b. Male and Female Symbols:
 - 1) Symbols: Blue.
 - 2) Background: White.

G. Room Capacity Signs:

1. Wording for sign at Assembly Rooms: See Plans and Signage drawings. Number to be on Drawings or provided by Architect.
2. Refer to Drawings for identification.

2.02 EXIT SIGNS; FLOOR LEVEL, SELF-LUMINOUS

A. General:

1. Conform to State Fire Marshal, Title 19.
2. UL listed 924 Floor-level exit signs.
3. UL listed 1994 floor-level exit markers and exit path marking.
4. ICC No. ESR-14-09.

B. Refer to Drawings for identification, symbols, sizes, configuration, and location.

C. Mounting Locations: Single-face for flat-to-wall mounting.

D. Acceptable Manufacturer and Product: Active Safety; Murray, Utah; 800-657-6324; Model #16.000 SWMA stencil-faced Exit Marker, or approved equivalent.

2.03 METAL SIGNS

A. Materials: Reflectorized sign shall be porcelain on steel with beaded text, galvanized steel post, and concrete footing.

- B. International Accessibility Symbol Signs:
 - 1. Types:
 - a. Accessible Parking Stall Signs.
 - b. Building Entrance Signs.
 - 2. Refer to Drawings for identification symbols, size, configuration, and locations.
- C. Accessible Parking Entrance (Tow-Away) Signs: Refer to Drawings for size, text, configuration, and locations.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts existing surfaces.

3.02 PREPARATION

Layout: Accurately lay out work to maintain proper lines, levels and spacing.

3.03 INSTALLATION

- A. Mounting:
 - 1. Press tape firmly to mounting surface, and secure each plaque or sign with minimum two screws.
 - 2. When mounting on glazing, press silicone adhesive firmly to glazing. Clean excess adhesive from glazing.
- B. Signs Mounted at Doors:
 - 1. Mount following signs on room doors.
 - a. Toilet Rooms: Accessibility geometric symbol signs. Mount with centerline of sign 60" above finish floor.
 - 2. Mount following signs or plaques adjacent to latch-side of doors:
 - a. Room Accessibility Sign.
 - b. Room Identification signs mounted with centerline of sign 60" A.F.F.
 - c. Room Capacity Signs: Mount on wall in visible location as directed by the Architect.
 - d. Exit Signs, self-luminous: Mount on wall adjacent to the exit.

3.04 SCHEDULE

- A. Plastic Accessibility Symbol Signs:
 - 1. Figure Symbols (Building Entrance Signs, Directional Signs and International Symbol of Access for the Hearing Impaired): Locate where indicated on the Drawings.
 - 2. Geometric Symbols (Toilet Room Signs): Locate one for each Accessible Toilet Room.

- B. Room Capacity Sign: Locate one sign in Assembly Room at Multi-Purpose Building, and where indicated on Drawings.
- C. Exit Signs (self-luminous): Locate at each exit door to the exterior and at each interior door when an exit light is shown.
- D. Metal Accessibility Symbol Signs:
 - 1. Accessible Parking Stall Signs: Locate where indicated on the Drawings.
 - 2. Building Signs: Locate where indicated on the Drawings.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Includes:
 - 1. Toilet compartments, floor-mounted, and braced head rail
 - 2. Staff Toilets: Phenolic
 - 3. Student Toilets: Polyethylene Resin
 - 4. Hardware
- B. Related Work:
 - 1. Requirements in Addenda, Alternates, Conditions, and Division 01 collectively apply to this work.

1.02 SUBSTITUTIONS

Only written approval of the Architect will permit substitutions for materials specified. Refer to Section 01 25 13 - Product Options and Substitutions for procedure.

1.03 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Submit for work, reference to Architect's detail numbers, four (4) copies.
 - 2. Indicate on shop Drawings, partition plan and elevations, dimensions, details of wall and floor supports, and door swings.
 - 3. Provide product data on panels, hardware, and accessories.
- B. Samples: Manufacturer's standard colors, in duplicate. Three (3) colors maximum to be selected.
- C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.04 PROJECT CONDITIONS

Coordinate installation with plumbing, toilet accessories, and other related work.

PART 2 – PRODUCTS: STUDENT TOILET

2.01 PARTITIONS

- A. Acceptable Manufacturers and Products Standard of Quality:
 - 1. Santana Products Company, Inc.; Scranton, PA; 800-368-5002. Poly-MAR HD

2. Scranton Products, Scranton, PA; 800-445-5148, HINY Hinders partitions.
3. Bradley Corporation, Menomonee Falls, WI; 800-272-3539, Bradmar Partitions, 400 Series

B. Materials:

1. Toilet partitions shall be overhead braced, floor-mounted, with non-corrosive panels, doors, and pilasters.
2. Top of overhead brace to not exceed 6'-8" A.F.F.
3. Panels, doors and pilasters shall be fabricated from high density polyethylene (HDPE) resins under pressure forming a single component section which is waterproof, non-absorbent and has a self-lubricating surface that resists markings with pens, pencils, or other writing utensils.
4. Panels shall meet or exceed the following burning characteristics:
 - a. Self-Ignition: 650°F; ASTM D1929-96(2001)e1.
 - b. Rate of Burn: 1.29 cm/minute; ASTM D635-03.
 - c. Smoke Density: Less than 75; ASTM D2843-99(2004)e1.
 - d. Recycled Content: 20% minimum.

C. Panel Construction:

1. Single component construction of solid polymer in color that extends from the surface throughout the core.
2. Panels and pilasters shall be 1" thick and edges machined to a radius of .250", and exposed surfaces to be free of saw marks (no other thickness acceptable).
3. Dividing panels shall be 55" high and mounted at 14" above finished floor. Aluminum edging strips shall be fastened to the bottom edge of panels full length. If desired, panel at the end of layout shall extend up and fasten into headrail.
4. Doors shall be 55" high and mounted at 14" above finished floor. Aluminum edging strips shall be fastened to the bottom edge of doors and side panels, full width.
5. Doors at front entry accessible stalls shall have 32" minimum clear width when door is open 90°. Doors at side entry accessible stalls shall have 34" minimum clear width when door is open 90°.
6. Doors at standard stalls shall be 24" wide.
7. Doors at semi-abulant stalls shall have 32" clear opening width.
8. Pilasters height (field verify) shall allow headrail bracket hardware not to be installed above ceramic tile wainscot and fastened to 3" high shoes fabricated from polymer material with theft-proof stainless steel sex bolts.

9. Finish of doors, panels, and pilasters shall be similar and equal to Santana Products Company, Inc., Poly-Mar HD. Color selections shall be made from manufacturer's full palette (2 colors maximum). Boys' and Girls' to have different colors.

D. Hardware:

1. Door hardware shall be as follows:
 - a. Hinges shall be heavy duty and continuous with self-closing spring loaded barrel action as manufactured by Santana 400 Series, or approved equivalent. Hinges shall be 6463-T5 extruded aluminum, 54" model with 27 bearing surfaces and 20 fastening points (10 to the door and 10 to the stall). Hinges shall be provided with cover caps. Hinges shall accommodate partitions and doors weighing up to, and not exceeding 75 pounds.
 - b. Each door shall be furnished with one coat hook/bumper of heavy chrome plated Zamac with rubber bumper. Wheelchair accessible doors include one u-shaped loop handle door pull on each side mounted at 34" to 44" a.f.f. below the latch and one wall stop. Mount coat hook at 48" above finish floor at accessible stalls.
 - c. Door strike and keeper shall be fabricated from heavy aluminum extrusion (6463-T5 alloy) with bright dip anodized finish with wraparound flange, surface mounted and through-bolted to door with one-way sex bolts. Hardware mounting height: 34" - 44" AFF.
 - d. Door slide latch housing shall be fabricated from heavy aluminum extrusion (6463-T5 alloy) with bright dip anodized finish, surface mounted and through-bolted to door with one-way sex bolts. Slide bolts and button shall be heavy cast aluminum, through-bolted to doors and pilasters with one-way sex bolts. Hardware mounting height: 30" - 44" AFF latch shall comply with Section 11B-404.2.7, current CBC. B-233, Stainless Steel.
 - e. Door coat hook, Bobrick B-233, Stainless Steel.
2. Pilaster shoes shall be anchored to finish floor with No. 5 plastic anchors and No. 14 stainless steel Phillips head screws.

3. Full-length continuous wall brackets shall be polymer weighing not less than .822 pounds per linear foot. Brackets shall be used for panels-to-pilaster, pilaster-to-wall and panel-to-wall connections. Manufacturer shall predrill wall brackets with holes spaced every 6" along full length of brackets. Wall brackets shall be through-bolted to panels and pilasters with one-way sex bolts. Attachment of bracket to adjacent wall construction shall be accomplished by vandal-proof sleeve anchors at 13" o. c. maximum.
4. Headrail shall be heavy aluminum extrusion (6463-T5 alloy) with mill finish in anti-grip configuration weighing not less than 1.18 lbs. per linear foot. Headrail shall be fastened to tops of pilasters and headrail brackets by through bolting with one-way sex bolts.
5. Headrail bracket shall be of 16-gauge stainless steel and not extend above ceramic tile wainscot.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop Drawings.
- B. Verify correct spacing of plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing, where required.
- D. Beginning of installation means acceptance of existing substrate.

3.02 INSTALLATION

- A. Erection of partitions shall be in accordance with the manufacturer's printed instructions and the following:
 1. Install partitions secure, level and plumb.
 2. No evidence of drilling, cutting or patching shall be visible in the finishes of work.
 3. Finished surfaces shall be cleaned after installation and left free of imperfections.
- B. Maintain 3/8" to 1/2" space between wall and panels, and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices. Panel hardware is not to extend above ceramic tile wainscot.

- D. Attach panels and pilasters to bracket with through sleeve tamperproof bolts and nuts. Locate headrail joints at pilaster centerlines.
- E. Attach edging strips, using vandal proof stainless steel fasteners.
- F. Anchor urinal screen panels to walls with continuous panel brackets and vertical upright consisting of pilaster anchored to floor and ceiling.
- G. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.
- H. Adjust hinges to locate doors in partial opening position when unlatched. Return outswing doors to close position.

3.03 ADJUSTING AND CLEANING

- A. Clean partitions.
- B. Adjust and lubricate moving parts to function properly.

END OF SECTION

Part 1 GENERAL

1.01 PRINCIPLE WORK IN THIS SECTION

- A. Pipe and pipe fittings.
- B. Valves.
- C. Natural gas piping system.
- D. Insulation.

1.02 REFERENCES

- A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.03 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

Part 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sleeved Roof Flashings:
 - (1) Smith.
 - (2) Stoneman.
- B. 'No Hub' Couplings:
 - (1) MG coupling.
 - (2) Clamp-All.
 - (3) Husky.
 - (4) Tyler.
- C. Gate, Globe, and Check Valves:
 - (1) Crane Co.
 - (2) Nibco, Inc.

(3) Hammond.

(4) Milwaukee.

D. Ball Valves:

(1) Apollo.

(2) Nibco, Inc.

(3) Hammond.

(4) Milwaukee.

E. Vent and Gas Cocks:

(1) Milwaukee.

(2) Apollo.

(3) Crane.

(4) Lunkeheimer.

F. Insulation:

(1) Johns-Manville.

(2) Imcoa.

(3) Owens Corning.

(4) Armstrong.

(5) Certain-Teed.

2.02 PIPE

A. Natural gas piping:

(1) Above ground: Black steel, Schedule 40.

(2) Below ground: Polyethylene pipe, ASTM D2513 marked for gas service and bearing manufacturer's name or trademark. An electrically continuous insulated no. 18 tracer wire or other approved material shall be installed with and attached to all underground piping and shall terminate above ground at each end of the pipe run.

2.03 Pipe fittings:

A. Natural gas piping:

- (1) Steel pipe: 150 lb. welded malleable iron.
- (2) Polyethylene pipe: Polyethylene heat fusion or mechanical type.

2.04 ACCESSORIES

A. Dielectric Unions and Insulating Couplings:

- (1) Similar to EPCO Model X or FX.

2.05 ESCUTCHEONS, FLASHINGS AND SLEEVES

A. Escutcheons: Polished chrome plated brass.

B. Flashings for pipes through roofs: Similar to Stoneman 1100 series.

C. Sleeves; of following types as required:

- (1) Schedule 40, galvanized steel pipe sleeves.

2.06 PACKINGS

A. Through fire rated partitions: Fire resistant sealing system acceptable to local jurisdiction.

2.07 VALVES, GENERAL

A. Provide valves of same manufacturer for all similar plumbing applications or systems. Valves, to have manufacturer's name and pressure rating clearly marked on outside of body.

B. For copper tubing provide solder-joint valves, flare fittings, or IPS-to-copper adaptor, sized for use with tubing and respective valve.

C. For flanged valves, provide streamline companion flanges, ANSI B16.5, 150 class psi.

D. Provide valves rated not less than 125 psi steam working pressure, unless indicated otherwise.

E. Provide valve materials suitable for service and temperature of respective systems, especially with respect to discs, plugs, balls, linings, gaskets, and lubricants of globe valves, plug cocks, ball valves, etc.

F. Provide all ball valves with "full port."

2.08 SAFETY AND RELIEF VALVES

A. Section 15440 - PLUMBING EQUIPMENT.

2.09 NATURAL GAS SYSTEM

A. Plug valves, 3 in. and larger:

- (1) CI body and plug.
- (2) Lubricated cast iron plug.
- (3) Flanged ends.
- (4) Wrench operated.
- (5) #175 W.O.G.
- (6) Similar to Rockwell Nordstrom No. 143.

B. Plug valves, 2 1/2 in. and smaller:

- (1) Bronze body and plug.
- (2) Threaded ends.
- (3) Square head.
- (4) #125 W.O.G.
- (5) Similar to Crane No. 250.

C. At Appliances:

- (1) Integral lever handle.
- (2) Similar to Crane No. 298.

2.10 INSULATION

A. General:

- (1) All insulation materials including jackets, facings adhesives, coatings and accessories are to be fire hazard rated and listed by Underwriters Laboratories, Inc. in conformance with UL723.
- (2) Insulation thickness and 'R' value ratios to be in accordance with state energy code.

B. Required Locations:

- (1) All interior Condensate piping.

C. Installation:

- (1) Insulation protection shields and spacing blocks are required at pipe hanger locations.

Part 3 EXECUTION

3.01 INSTALLATION

A. Arrangement:

- (1) Except for large scale details piping is diagrammatically indicated: Install generally as shown.
- (2) Do not scale Drawings for exact location of piping.
- (3) Install piping to best suit field conditions and coordinate with other trades.
- (4) Each piping group to be in one plane, insofar as possible.
- (5) Do not sleeve structural members without consent of Architect.
- (6) Maintain 1 inch clearance from adjacent work, including insulation, except as noted or approved.
- (7) Install piping concealed above ceilings or in walls unless otherwise indicated.

B. Expansion, Contraction and Bending:

- (1) Install piping with provisions for expansion and contraction: Provide expansion loops, swing joints, and/or expansion joints where indicated.
- (2) Do not spring or force piping during installation.

C. Sloping and Draining:

- (1) Slope piping per general notes true to line and grade, and free of traps and air pockets.

D. Strainers: Install ahead of all reduced pressure backflow preventers and pressure regulators.

E. Copper:

- (1) Crimping of copper tubing prohibited.
- (2) Isolate copper pipe and tubing from contact with steel hangers or stud wall construction.

- (3) For branch drops and rises to plumbing fixtures, anchor branch to wall with drop-ear ell or tee.
- F. Coatings (buried piping): Reapply coal-tar coating on buried ferrous piping, after installation, to surfaces from which coating has been removed or scraped.
- G. Wrapping (buried piping): Provide a minimum of 20 mil thickness polyvinyl tape similar to Calpico V-20 for all buried copper lines.

3.02 SYSTEMS INSTALLATION

A. Natural Gas:

- (1) Make equipment connections with ground joint unions and gas cocks.
- (2) Provide accessible shut-off valves:
 - a Each entrance to each building
 - b At each individual piece of equipment with gas connection.

3.03 PIPE JOINTING

A. Prohibited fittings:

- (1) Bushings on pressure piping
- (2) Clamp-on branch connections.
- (3) No-hub couplings on pumped sanitary or wastewater discharge piping.

B. Provide insulating couplings or dielectric unions at all connections of ferrous piping to non-ferrous piping.

C. Unions: Provide unions or flanges to render all items in systems easily removable, including:

- (1) Piping specialties.
- (2) Both sides of pumps and equipment.

D. Pipe Ends:

- (1) Perform pipe cutting and end preparation to result in clean ends with full inside diameter.
- (2) Grind and ream as necessary, burred ends of all pipe and tubing shall be reamed to the full bore of the pipe or tube and all chips shall be removed.

E. Nipples:

- (1) Close nipples not permitted.
- (2) Provide extra heavy pipe for nipples where unthreaded portion is less than 1-1/2 in. long.

F. Threaded Joints:

- (1) Sealed with sealant compounds or teflon tape.
- (2) Sealant compounds: Similar to John Crane or Rector Seal.

G. Soldered and Brazed Joints:

- (1) Use no-lead, solder for all copper piping.
- (2) Clean surfaces to be jointed of oil, grease, rust and oxides:

H. No-Hub Cast Iron Soil Pipe:

- (1) Neoprene gaskets and cast iron split clamps secured by stainless steel bolts and nuts, similar to MG Coupling Co. or 24 gauge Type 304 stainless steel housing and clamp; similar to Clamp-all, Tyler or Husky.
- (2) Where components are suspended in excess of 18 in. by means of non rigid hangers, brace against horizontal movement (sway brace).
- (3) 6 in. and larger: brace to prevent horizontal movement at every branch opening and change of direction by securing to building structure.
- (4) Vertical piping shall be supported at each stack base and at each floor. Free standing vertical piping should be adequately staked or braced during construction to maintain alignment.
- (5) Horizontal piping shall be supported within 24 in. of the Coupling joint at 10 ft. intervals for 10 foot pipe lengths and at 5 ft. intervals for 5 ft. Piping lengths. Supports or hangers should be properly placed to maintain alignment and grade with provision made to prevent shear.

3.04 ESCUTCHEONS, FLASHING AND SLEEVES

A. Escutcheons:

- (1) Install at exposed piping penetrations of walls, floors and ceilings. "Exposed" means all finished rooms, including storage, janitor and mechanical rooms.
- (2) Where piping is insulated, escutcheons shall fit insulation outside diameter.

B. Flashings:

- (1) Flash and counter-flash watertight all pipe and duct penetrations of roofs and exterior walls.
- (2) Flash pipes through roofs with vandal caps for vents.
- (3) Provide counter-flashing sleeves.
- (4) Other flashings shall be galvanized sheet metal.

C. Sleeves:

- (1) Provide membrane clamps at penetrations of membranes.
- (2) Other concrete walls, floors and roofs:
 - a Adjustable telescopic metal sleeves.
 - b Tightly pack annular space between pipe and sleeve with approved compound.
- (3) For insulated piping, sleeve diameter shall not be less than diameter of insulation.
- (4) Terminate sleeves flush with walls, and ceiling.
- (5) For exposed vertical pipe, extend sleeves 1 in. above finished floor except where escutcheons are required.
- (6) Packing through fire rated partitions shall be a fire resistant material acceptable to local jurisdiction.

D. Separate piping through walls, other than concrete walls, from contact with wall construction materials. Use non-hardening caulking, fire rated where necessary.

3.05 ADJUSTMENT AND CLEANING

A. General:

- (1) During installation, keep openings in piping closed to prevent entrance of foreign matter.
- (2) Provide covers for floor drain gratings during construction to prevent use accumulation of debris.
- (3) Clean pipe, fittings and valves internally.

B. Water systems: Upon start-up fill with clean water.

3.06 FIELD QUALITY CONTROL - PIPING

A. Tests:

- (1) Refer to other sections for tests to plumbing systems and other special piping systems.
- (2) Notify Architect in writing one week before test.
- (3) Furnish written report and certification that tests have been satisfactorily completed.
- (4) Repair or replace leaks and defects without additional cost.
- (5) All fusing procedures to be inspected and documented for acid waste system.

3.07 PROVIDE VALVES AT FOLLOWING LOCATIONS

- A. In all branches or headers serving more than one fixture or piece of equipment.
- B. For shut-off of risers and branch mains.
- C. For branches from main or riser serving one fixture.
- D. On each side of all apparatus such as pumps, tanks, heaters, control valves, etc.
- E. For flushing, draining, and sterilizing the systems.
- F. Valves should be of domestic manufacture.

3.08 INSTALLATION, GENERAL

- A. Pressure rating of valves same as piping in which installed.
- B. Install valves with stems upright or horizontal.
- C. Install swing checks in horizontal position.
- D. Provide silent check valves at discharge of pumps.
- E. Provide drain valves at main shut-off valves, low points of piping and apparatus.
- F. Locate wheel handles to clear obstructions when operated with hands.
- G. Locate equipment shut-off valves to be accessible without climbing over equipment.

3.09 VALVE APPLICATIONS

A. Gate Valves:

- (1) Shut-off, sectionalizing and isolation.
- (2) Drain valves.

B. Globe and Angle Valves:

- (1) Balancing water.
- (2) Throttling: water, and air.
- (3) By-pass.

C. Plug cocks:

- (1) Balancing and throttling: water.
- (2) Shut-off: gas.
- (3) Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

3.10 FIELD QUALITY CONTROL - VALVES

- A. Test operate valves from closed-to-open-to-closed position while valve is under test pressure.
- B. Test valve bonnets for tightness.
- C. Check all valves for packing. Replace leaking packing.
- D. Test temperature and pressure relief valves three times.
- E. Check all valves for lubricant. Service valves which do not operate smoothly with suitable lubricant before placing in operation.

3.11 TESTS - DRAINAGE SYSTEMS

- A. Drainage and vent piping inside building and underground metallic piping (including house sewers) shall be tested as follows:
 - (1) Water tests: Water test: If tested in sections, fill each section with water to overflowing, from ten ft. above or floor-to-floor height, whichever is greater, so that all of each section, except the topmost, is tested with a head of at least ten ft.. For soil and drain lines located above food storage or preparation area, perform a minimum 25-foot standing water test. Water level shall remain constant throughout test without adding water for a minimum of two hours.

- (2) Smoke test: Smoke test: After drainage connections have been completed and fixtures have been set, fill traps with water and introduce into entire system at base, thick penetrating smoke produced by a smoke machine. Chemical mixtures will not be allowed. As smoke appears at roof openings, close opening tight and apply pressure equivalent to one in. of water. Maintain test for a minimum of one hour.

3.12 INSTALLATION

A. Minimum Cover Underground Piping: Per local Codes.

B. Piping:

- (1) Free of traps.
- (2) Grade and valve for complete control and drainage of system with drain cocks at low points and base of valved risers.

3.13 DISINFECTION

A. Cleansing and Disinfecting:

- (1) Disinfect underground water mains after installation and test in accordance with requirements of local codes.
- (2) Disinfect interior potable water distribution system in accordance with requirements of local codes.

END OF SECTION

Part 1 GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Furnish labor, materials, tools, and equipment to install plumbing systems as indicated.
- C. Related Sections:
 - (1) Section 23 05 00: Basic Mechanical Requirements.
 - (2) Section 23 05 13: Basic Mechanical Materials and Methods.
 - (3) Section 23 05 48: Mechanical Sound, Vibration and Seismic Control.
 - (4) Section 23 05 53: Mechanical Identification.
 - (5) Section 23 07 00: Mechanical Insulation.
 - (6) Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.
 - (7) Division 26: Electrical.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.

1.03 QUALITY ASSURANCE

- A. Conform to provisions of Section 15010: Basic Mechanical Requirements.
- B. Manufacturer of plumbing products shall obtain ANSI/NSF Standard 61, Section 9 certification to demonstrate compliance with the federal requirements for lead contribution to drinking water (Safe Drinking Water Act SDWA).

1.04 PRODUCT HANDLING

- A. Conform to provisions of Section 15050: Basic Mechanical Materials and Methods.

Part 2 PRODUCTS

2.01 PIPING SYSTEMS

- A. Materials: Refer to Section 15050: Basic Mechanical Materials and Methods.
- B. Insulation for Piping: Refer to Section 15080: Heating and Air Conditioning Piping Systems.

Part 3 EXECUTION

3.01 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose off the Project site.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. This section provides the basic mechanical requirements that apply to the Work of Division 15.
- C. Related Sections:
 - 1. Division 16: Electrical.

1.02 REGULATORY REQUIREMENTS

- A. Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less. Under California regulations pipes and pipe fittings are considered lead-free when they contain 0.25 percent lead or less as defined in California Assembly Bill 1953 (AB 1953). No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25.
 - 1. Provide lead-free water pipe, solder, and flux materials that meet the standards as outlined by the federal SDWA regulations and California AB 1953 if installed in drinking water system.
 - 2. Collect pipe, solder, and flux material samples as required by the PI. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.
 - a. Test samples for lead content by the atomic absorption spectrophotometry method.
 - 3. Materials found not conforming to SDWA and California AB 1953 regulations shall be deemed defective Work and shall be replaced with lead-free materials.

4. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the PI.
- B. Workmanship, materials, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:
1. AMCA - Air Moving and Conditioning Association.
 2. ANSI - American National Standards Institute.
 3. ASME - American Society of Mechanical Engineers.
 - a. Boiler and Pressure Codes.
 - b. Code for Pressure Piping.
 4. ARI - Air Conditioning Refrigeration Institute.
 5. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers.
 6. ASTM - American Society for Testing and Materials.
 - a. ASTM A53 Specification for Welded and Seamless Pipe.
 7. AWA - American Waterworks Association.
 8. CSA - Canadian Standards Association.
 9. FMG - Factory Mutual Global.
 10. IAPMO - International Association of Plumbing and Mechanical Officials.
 11. NFPA - National Fire Protection Association.
 12. OSHA - Occupational Safety and Health Administration.
 13. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Inc.
 14. UL - Underwriters Laboratories.
- C. Workmanship, materials, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:

1. CBC, CMC, and CPC - latest editions including amendments effective on the Effective Date of the Contract.
 2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.
 3. California Building Code (CBC).
 4. OSHA - Occupational Safety and Health Administration.
 5. Department of Health.
 6. South Coast Air Quality Management District.
- D. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.
- E. Permits and Fees: Refer to the General and Supplementary Conditions.

1.03 SUBMITTALS

- A. Provide submittals in accordance with Section 01300 and with specific requirements of Division 15 sections, as applicable.
- B. Submit the following:
1. Complete materials list of items to be furnished and installed under this Division.
 2. Shop Drawings, as required.
 3. Manufacturer's specifications and other Product Data to demonstrate compliance with specified requirements.
 4. Manufacturer's printed installation instructions.
 5. Catalog cut sheets.
- C. After Architect's approval, the above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.
- D. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in AutoCAD may be provided by the Architect to serve as a background for the Shop

Drawings. Shop Drawings shall be in AutoCAD, shall comply with the requirements of Section 01100 Coordination and Section 01300 Submittals and shall indicate at a minimum:

1. Complete system layout of equipment, components, ductwork, and piping, indicating service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger / support locations. All the above items shall be coordinated on the shop drawings according to the requirements of Section 01100.
2. Schedule and description of equipment, ductwork, piping, fittings, valves, dampers, and controllers.

1.04 PROJECT RECORD DOCUMENTS

- A. Comply with provisions of Section 01770: Contract Closeout.
- B. Project Record Drawings:
 1. Provide a complete set mechanical, plumbing, fire protection and control system drawings in AutoCAD, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full-size reproducible plots on vellum and 3 sets of prints.
 2. Before Contract Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.
- C. Operation and Maintenance Manuals:
 1. Submit 2 copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return 3 copies of manuals. Manuals shall be bound in hardback, 3-ring, loose-leaf binders. Deliver manuals to the OAR. Submit an electronic copy of the entire manual in Adobe Acrobat (PDF file) format.
 2. Contents of Manual:
 - a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

- b. Manufacturer's operating instructions including, but not limited to, the following:
 - 1) Identification of components and controls.
 - 2) Pre-start checklist and start-up procedures.
 - 3) Normal operation settings and checklists.
 - 4) Pre-shut down checklist and shut down procedures.
 - 5) Trouble shooting checklist and guidelines.
 - 6) Recommendations for optimum performance.
 - 7) Warnings and safety precautions on improper or hazardous operational procedures or conditions
- c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 15 that includes the following as a minimum:
 - 1) Manufacturer's model, identification and serial numbers.
 - 2) Exploded view of assembly drawings identifying each component or part with the relevant part number.
 - 3) Directory of manufacturer's representatives, service contractors and part distributors.
 - 4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.
- d. Project Record Drawings: Complete set of mechanical, plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.
- e. Test and balance reports: Submit as specified in Section
- f. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as

01450.

required by SCAQMD to allow start-up and operation of equipment.

- g. San Bernardino County industrial waste permits.
- h. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.
- i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 PROTECTION, CARE AND CLEANING

- A. In addition to storage criteria of the General Conditions, and provisions under Section 01500: Construction Facilities and Temporary Controls, the following shall be provided:
 - 1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.
 - 2. Protect installed Work.
 - 3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.
 - 4. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.
 - 5. Do not store plastic pipe or materials in direct sunlight.
 - 6. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.
 - 7. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.
 - 8. Air handling equipment shall not be operated until building is cleaned and air filters are installed.
 - 9. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

10. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.

1.06 COORDINATION

- A. Contract Documents indicate extent and general arrangement of Work under Division 15. Contractor shall coordinate work in accordance with Section 01100 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.
- B. Do not store plastic pipe or materials in direct sunlight.

1.08 PRELIMINARY OPERATION

- A. OAR may require any portion of mechanical Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.
- B. Notify the PI at least 24 hours in advance of lighting or re-lighting pilots.

1.09 TRAINING OF OWNER PERSONNEL

- A. Training of Owner's personnel shall include:
 1. A minimum of 4 hours of on-site overview of the overall Mechanical System.
 2. Refer to Division 15 sections for specific training on each of the components of the Mechanical System.
- B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance,

troubleshooting, and Project site repair of each component, equipment, or system provided under this Contract.

- C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.
- D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by OAR.
- E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the OAR and kept as part of the project documents.

1.10 GUARANTEES AND DAMAGE RESPONSIBILITY

- A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.
- B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.
- C. HVAC equipment products from different manufacturers are never identical. Equipment approved as being equal is interpreted as being equivalent in capacity, performance and quality. The dimensions, weight, configuration and utility requirements could be quite different from the equipment used as the basis of design. Due to these differences, additional coordination and adjustments by the Contractor are required. For the equipment to be deemed truly equal, the additional coordination and adjustments by the Contractor should not incur any additional cost to the Owner and any additional labor to the design team.
- D. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by

authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. All the additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

- E. For substitution of materials or products, refer to the General Conditions.

PART 3 – EXECUTION

3.01 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

- A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and/or facilities.
- B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.
- C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.02 CUTTING, NOTCHING AND BACKING

- A. Conform to California Building Code, Title 24, Part 2, Sections 2308.9.10 and 2308.9.11, for notches and bored holes in wood; Section 1906A.3, for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.
- B. Where pipes or ducts pass through or are located within one inch of any construction element, install a resilient pad, 1/2-inch-thick minimum, to prevent contact.
- C. Furnish all necessary provisions for recesses, chases, accesses, and provide blocking and backing as necessary for proper reception and installation of mechanical Work.

3.03 LOCATION OF PIPING AND EQUIPMENT

- A. Location of piping, apparatus, and equipment as indicated on Drawings is approximate and shall be altered to avoid obstructions, preserve headroom and provide free and clear openings and passageways.
- B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

- C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.
- D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.04 TESTS AND TESTING

- A. Tests shall be as required under the applicable sections of Division 15, including this section.
- B. Tests required by other sections of the Contract Documents include the following:
 - 1. Test and balance of mechanical equipment and systems: Refer to Section 01450: Test and Balance
 - 2. Hydrostatic test of boilers: Refer to Section 01450: Test and Balance
 - 3. Test of smoke and fire detectors: Refer to Division 16: Electrical
- C. Additional tests may be required in the case of products, materials, and equipment if:
 - 1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.
 - 2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.
- D. Piping Tests:
 - 1. Perform tests required to demonstrate that operation of mechanical systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the PI, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.
 - 2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.
 - 3. Pressure gauges furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.
 - 4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a

minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.
6. Refrigerant piping may be tested with a halide detector or calibrated electronic testing equipment.
7. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the PI.
8. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

E. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:
Durham system, glass or plastic acid waste, vent and roof drain (except pipes running under a slab or underground)	Fill with water to top of highest vent, allow to stand two hours, or longer, as required by Inspector. Minimum head required for any joint shall be 10-feet in building.	Water
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10' of water, vertically	
Storm water disposal lines	Running water test	Water
Domestic water piping	200	Water
Gas piping (steel threaded or plastic)	60 (both tests)	Air
Gas piping (steel welded)	100 (both tests)	Air
Gas welding station	1-1/2 Working pressure 100 min.	Dry nitrogen
Refrigeration piping		

R-22	400	Dry nitrogen
R-134a	300	Dry nitrogen
R-401a	300	Dry nitrogen
R-401b	300	Dry nitrogen
R-404a	500	Dry nitrogen

F. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed, recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and/or materials shall be replaced or repaired as required.
2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.
3. Run test the equipment after start-up for five consecutive days. Tests shall include operation of heating, ventilating, and air conditioning equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified heating and cooling capacities. If equipment passes, install new filters. If equipment fails, it shall be adjusted and retested until system meets all applicable codes.
4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

- a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.
 5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.
 6. Provide electric energy and fuel required for tests.
 7. Final adjustment to equipment or systems shall meet specified performance requirements.
 8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.
- G. Specific Coordinated Plan for Test & Balance:
1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.
 2. Prior to final test and balance, mechanical equipment and systems shall be operated and tested as indicated in Article F above to demonstrate satisfactory overall operation of the installed systems.
 3. Immediately before starting tests, air filter media shall be cleaned or renewed. Roll-type filters shall be advanced to provide new clean media. Cleanable type media shall be thoroughly cleaned and re-oiled with new, clean oil as recommended by manufacturer if they are of viscous impingement type. Disposable type filters shall be replaced with new filters. Replaceable media shall be replaced with new media.
 4. An accurate means of measuring air flow and temperatures shall be furnished to balance air supply, return, and exhaust systems so uniform temperatures occur in every room and design airflow is obtained through registers, diffusers, and grilles.
 5. Systems shall be adjusted to provide airflows indicated including maximum fresh air and maximum return air. Dampers shall be checked for proper settings and operation. Air and water inlet and leaving temperatures at coils shall be checked. Complete operational data including airflows, room temperatures, fan speeds, motor currents, plenum, and duct static pressures shall be tabulated.
 6. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with

requirements specified in Section 15050: Basic Mechanical Materials and Methods.

3.05 NOISE AND VIBRATION REDUCTION

- A. Correct noise or vibration caused by mechanical systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level
- B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.06 PROTECTION, CARE AND CLEANING

- A. In addition to storage criteria of the General Conditions, and provisions under Section 01500: Construction Facilities and Temporary Controls, the following shall be provided:
 - 1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.
 - 2. Protect installed Work.
 - 3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.
 - 4. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.
 - 5. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.
 - 6. Air handling equipment shall not be operated until building is cleaned and air filters are installed.
 - 7. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.
 - 8. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date

of element before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.

END OF SECTION 23 05 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. This Section prescribes basic materials and methods generally common to the Work of Division 15.
- C. Related Sections:
 - 1. Section 01450: Tests and Balance
 - 2. Section 02318: Excavating, Backfilling and Compacting for Utilities.
 - 3. Division 15: Mechanical.
 - 4. Division 16: Electrical.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01, Section 15010 and specific requirements of each section of Division 15.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with applicable national, state, and local codes and standards: ASTM, ASME, ANSI. Federal Specifications, AWWA, SISPI, NFPA, FM, UL, CPC California Plumbing Code, CMC, CSA.
- B. Qualifications of Manufacturer: Products used in the Work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the Architect.
- C. No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25%.

1.04 COORDINATION

- A. Coordinate related Work in accordance with provisions of Section 01100: Coordination.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.
- B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing codes and applicable standards as specified in Section 15010, manufacturer's instructions or as required.
1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.02 MANUFACTURERS AND MATERIALS

- A. Ball Valves: Bronze, 2 inches and smaller:

NOTE: Ball Valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this specification.

BV-1 Class 150, 600 psi, CWP, 2-piece construction reinforced Teflon seats, Full port, adjustable packing gland, stainless ball and stem, threaded ends.

Hammond 8303A, Nibco T585-7066, Milwaukee BA400S or equal.

- B. Check Valves:

NOTE: Check Valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this specification.

1. Bronze, 2 inches and smaller:

CHV-1 Class 125, 200 CWP swing check, Teflon disc, threaded ends.

NIBCO T-413-Y, Milwaukee 509-T, Hammond IB-940 or equal.

C. Earthquake Valve: (Shall be DSA listed type)

EQV-1 Mechanically triggered by seismic movement, complying with state of California seismic response specifications, UL listed and certified by D.S.A. Size and pressure as required or indicated on Drawings. [(Minimum 1/4 psi, maximum 10 psi)]. Earthquake valve shall shut off gas automatically during an earthquake to prevent an explosion or fire. Valve shall be Koso California seismic valve, or equal.

1. Not sensitive to vibrations caused by passing trucks or accidental bumping.
2. Sensitive to wide amplitude G's only. Preset at factory for the correct G-rating.
3. Positive sealing from -10 degrees F. to 150 degrees F.
4. Visual open-close indicator.
5. Manual reset.
6. Plumb line for mounting.
7. Tripping mechanism has non-creeping rolling latch.
8. Install valve per manufacturer's recommendations only.

D. Gate Valves:

NOTE: Gate valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this specification.

1. Bronze, 2 inches and smaller:

GV-1 Class 125, 200 psi CWP, bronze body and bonnet non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Hammond IB645, Crane 1701, Walworth Fig. 7, Milwaukee 105, American 3F, NIBCO T-113 or equal.

GV-1A Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

APPLICATION: Use on domestic hot and cold water systems.

GV-2 Same as GV-1, except solder ends:

NIBCO S 113, Milwaukee 115, Hammond IB 647 or equal.

GV-2A Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

APPLICATION: Use on domestic hot and cold water systems.
--

GV-3 Class 125, 200 psi WOG, rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Stockham B-100, Crane 428, NIBCO T-111, Milwaukee 148, Hammond IB-640 or equal.

E. Globe Valves: Bronze, 2 inches and smaller:

NOTE: Globe valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance of article 1.03 of this specification.
--

GLV-1 Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Hammond IB440, Milwaukee 502, Stockham B-13-T, NIBCO T-211-Y, Crane 5TF or equal.

GLV-1A Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Milwaukee UP 502, Hammond UP 440 or equal.

APPLICATION: Use on domestic hot and cold water systems.
--

LV-2 : Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, solder ends.

Hammond IB-418, Milwaukee 1502, NIBCO S-211-Y or equal.

F. Heater Vent Pipe:

1. Schedule Number:

HVP-1 Shall be UL approved for service specified. CBC (California Bldg. Code) Concealed heater vent pipe, including pipe in or through attic spaces, shall be approved double wall metal vent pipe. For recessed wall heaters, furnish B.W. type. All others may be Type B, or B.W. Clearances must comply with CBC code and conditions of UL listing.

American Metal Products Co., Inc., Dura-Vent Corp., Ameri-Vent,
Duravent, Hart and Cooley Mfg. Co., Metalbestos or equal.

G. Piping:

NOTE: All pipes in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance of article 1.03.C of this specification.

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.
 2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in Section 15075: Mechanical Identification.
 3. Refer to Heating and Air Conditioning Piping Systems: Section 15180 for heating and chilled water piping and fittings.
 4. Schedule Number: Description
- | | |
|-----|---|
| P-1 | Cast iron – Hubless, service weight, . ASTM A888, CISPI 301, conforming to CISPI 310 and installed in accordance to IAPMO IS 06. American Foundry, Tyler, or AB & I or equal. |
| P-2 | Galvanized steel, Schedule 40, ASTM A53., US Steel or equal. |
| P-3 | Copper drainage tube, underground, type L hard, ASTM B 88, Mueller, Cerro Brass or equal. |
| P-4 | Copper drainage tube, inside structure and above grade. Type DWV hard temper, ASTM B 306, Mueller, Anaconda, Cerro Brass, Cambridge-Lee, Halstead or equal. |
| P-6 | Copper water tube, Type L hard, ASTM B88. Mueller, Cambridge-Lee, Halstead or equal. (when used above ground only) |
| P-7 | Copper water tube, Type K hard, ASTM B88, by Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal. |

- P-9 Red seamless brass, 85-5-5-5, iron pipe size (IPS), threaded pipe, ASTM B43 Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal.
- P-10 Black steel pipe, Schedule 40, ASTM A53, Type E, ERW by US Steel, or equal.
- P-11 Seamless copper tubing, tempered drawn, Type M, ASTM B88 by Mueller, Cerro Brass or equal.

H. Pipe Fittings:

NOTE: All pipe fittings in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03.C of this specification.

- PF-1 Cast iron, soil or waste no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless-steel clamps. 2 bands for size 1 ½" thru 4", IAPMO, ASTM C 564 and CISPI 310.

American Foundry, Tyler, or equal.

- PF-2 Cast iron, soil or waste, Heavy-duty no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless-steel clamps. 4 bands for size 5" thru 10". IAPMO, ASTM C564 and CISPI 310.

American Foundry, Tyler, or equal.

- PF-3 Malleable iron, Class 150, threaded, galvanized, beaded, ANSI B 16.3. P-2 Stockham, Stanley Flagg, Grinnell Or equal.

- PF-4 Cast brass drainage fittings ASA B 16.23, ASTM B 42. Provide with copper drainage tube.

Mueller Brass, Nibco, Stanley Flagg, Lee Brass Or equal.

- PF-5 Wrought copper - solder type ANSI B 16.22

Mueller Brass, Nibco, Lee Brass or equal.

- PF-8 Bronze and brass, 250 psi, threaded, ASA B16.17 and F S WW-P-460

Mueller Brass, Lee Brass Or equal.

- PF-9 Malleable iron, Class 125, ANSI B 16.3, threaded or welded Schedule 40 black steel for 2 inches and below and welded for 2-1/2 inches and above, by Stockham or equal.

- PF-11 Cast-iron OD sized, bell and spigot gasket joints.

PF-12 Steel butt weld type, ASTM A 234WPB.

I. Pipe Isolators:

PLA-1 Absorption pad shall be not less than 1/2 inch thick, unloaded. Pad shall completely encompass pipe.

Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator or equal.

PLA-2 Plastic cushion to form an insulating liner and eliminate metal to metal contact when securing copper tubes and pipes in air conditioning and refrigeration insulation preventing galvanic erosion.

Hydra-Zorb Cushion Clamps, Acousto-Clamp or equal.

J. Pressure Gauge: Aluminum or steel case, minimum 4-1/4 inches dial; pressure type or combination vacuum-pressure type, with provisions for field calibration. Dial indicator to indicate pressure in psi with accuracy to within plus or minus 0.5 percent of maximum dial reading. Furnish gages with restriction screw, size 60, to eliminate vibration impulses. Black case and ring, bourdon tube of seamless copper alloy with brass tip and socket. Three-way gauge cock, constructed of brass with stuffing box, 1/2 inch couplings, with fixed or movable cap nut to shut off pressure gauge.

PG-1 Pressure type, black drawn steel case, 4-1/2 inches glass dial, range approximately twice line pressure.

Marsh Keckley TericeWeksler Weiss

K. Plug Valves:

PV-1 2 inches and smaller: Rockwell No.114, lubricated plug type, 200 lb., water operating gauge pressure iron body and plug, regular pattern, threaded, with indicating arc; by Walworth, Homestead, WKM, or equal.

PV-2. 2-1/2 inches and larger: Rockwell No.115 and No.165 lubricated plug type, 200 lb. water operating gauge. Iron body and plug, regular pattern, flanged, with indicating arc. Walworth, Homestead, WKM, or equal.

L. Safety, Relief Valves:

SRV-1 Combination temperature and pressure relief type. CSA approved. Set to open at 125 psi pressure.

Watts 40L Cash-Acme NCLX-1

SRV-2 Same as SRV-1, except provide on storage type water heater with anode in dip tube.

Watts 10 x L

Cash Acme NCLX-1

M. Strainers:

STR-1 Description: Wye type with monel or stainless-steel strainer cylinder (manufacturer's standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe valve) blowout piping, same size as blowout plug.

1. 2 inches and smaller:

C.M. Bailey No.100-A, 250 lb., cast iron body, threaded, Keckley 'B'.

STR-2 Y pattern cast iron bodies, 125 psi, monel screen. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2 inches, flanged ends fusion bonded epoxy coated for 2 1/2 inches and larger perforations, in accordance with the following:

1. Steam service - 40 sq. mesh.
2. Other services - 16 sq. mesh.

Bailey No.100 Armstrong RP&C Keckley

N. Thermometers Industrial:

T-1 Straight type with fixed or ratable stem, extruded or cast brass or cast aluminum case and brass separable well 6 inches minimum scale, angle or straight type range 30 degrees - 240 degrees F.

Weksler Terice Weiss

T-2 Round type 3-1/2 inches minimum dial range of 100 between 30 degrees and 155 degrees F., color coded red above 150 degrees F. Brass chrome plated case.

O. Thermometers (Remote):

T-3 Liquid-filled capillary type with bulbs as required for remote and insertion mounting dials of 3-1/2 inches minimum diameter, non-ferrous internal parts, external means for re-calibration, glass or plastic lens and steel or non-ferrous case suitable for wall, duct or panel mounting range 30 degrees - 240 degrees F.

- P. Pipe and Fitting Requirements Schedule: Unless otherwise specified or indicated on Drawings, pipe and fittings shall be installed in accordance with the following table:

TABLE I
PIPE AND FITTING SCHEDULE

Use	Limits	Pipe	Fittings
Domestic hot and Cold water, underground	Up To 8 inches	P-6	PF-5
Copper, underground only		P-7	PF-5
Cold water, underground (Site piping)	4 inches and over	P-14	PF-11
Domestic hot and cold water, in building and above ground	All	P-6	PF-5
In building above ground	2" to 8"	P-6	PF-5
Compressed air	Underground or in concrete	P-9	PF-8
	Above ground	P-10	PF-3
Drains from HVAC Equip.		P-6	PF-5
Downspouts, interior above and below grade, up to 5 feet from building.		P-1	PF-1 Or PF-2
Gas Natural	Underground	P-8	PF-6
Gas Natural	Above ground	P-10	PF-9
Copper Drainage Tube (Underground)	Waste and Vent	P-3	PF-4
Copper Drainage	Waste and Vent	P-4	PF-4

Tube (Above Ground)			
Vents	New Building	P-1	PF-1 or PF-2 (IRE) if required by engineer
Vents	Existing Buildings and Exposed Downspouts	P-2	PF-3
Waste lines, Sanitary		P-1	PF-1 or PF-2 (IRE) if required by engineer

Q. Unions:

1. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished):
 - a. At each threaded or soldered connection to equipment and tanks, except in Freon or fuel gas, piping systems, whether indicated or not.
 - b. At downstream, threaded connection to each manually operated threaded valve and cock, and each threaded check valve, except those in Freon piping systems, and except those in yard boxes or access boxes, whether indicated or not.
 - c. At each threaded connection to threaded automatic valves (except those in freon piping systems) such as reducing valves and temperature control valves, whether indicated or not.
 - d. If grooved piping is used, couplings shall serve as unions. Additional unions are not required
2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.
- B. Pipe Installation:
 - 1. Install piping parallel to wall and provide an orderly grouping of proper workmanship.
 - 2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.
 - 3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the Architect.
 - 4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.
 - 5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.
 - 6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Kees Protecta-Plate, or equal.
 - 7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the Architect, or indicated on Drawings.
 - 8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping.
 - 9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.
 - 10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of

pipe being installed and except where their installation is specifically reviewed by the Architect.

11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 15010: Basic Mechanical Requirements.
12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top of sewer line.
13. Hot and chilled water circulating piping installed for space heating or cooling shall pitch up to a high point at a slope of 1/4 inch in 10 feet in the direction of flow. Where supply and return lines are exposed, both lines shall pitch in same direction. Otherwise, where possible, lines shall pitch up toward compression tank.
14. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide and install pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide and install adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors

(For fire rated wall penetrations follow the California Building Code)
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2. Sleeves shall provide 1/2 inch clearance around pipes, except plastic pipe shall have 1-inch clearance. Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.
3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings

may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.

4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between 2 or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.
5. Where pipes pass through waterproofed walls, floors, or floors on grade, caulk with Link-Seal Modular Seals or equal between pipe and sleeve to provide a waterproof joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of caulked sleeves if reviewed by the Architect.
6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of caulked or compression joint to allow for expansion.
7. Provide and install polished, chrome-plated flanges when plumbing pipes pass through walls at plumbing fixtures, etc., as specified in Section 15400: Plumbing. Provide and install polished steel, chromium-plated split floor and ceiling plates at locations where pipes pass through walls, floors, ceilings, and partitions in finished portion, which neatly conceals pipe insert.
8. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.

NOTE: Certificate described above is not valid unless it has been issued while welder was working for his current employer, and unless welder has performed type of work described by certificate in the preceding 3 months. Requirements for possession of a valid certificate shall not be waived for welders fabricating unfired pressure vessels when the Specifications require compliance with ASME code or when welding pipe carries working pressures greater than 75 psi and temperatures greater than 250 degrees F.

D. Pipe Joints and Connections:

1. Pipe and tubing shall be cut per IAPMO 1.S. Pipe shall have rough edges or burrs removed so that a smooth and unobstructed flow shall be provided.
2. Hot tapping of gas lines is strictly prohibited.

3. Threaded Pipe: Joints in piping shall be installed according to the following service schedule:
 - a. Refrigerant and Soap Piping: Litharage and glycerine, or Expando, or equal.
 - b. Plastic Piping: Teflon pipe joint compound tape.
 - c. Oxygen Piping: Wash treads with S.P., rinse, blow-dry and apply litharge and glycerine.
 - d. Cleanout Plugs: No compound shall be used. After inspection and test, plugs shall be removed, cleaned, greased, and replaced.
 - e. All other services Furnish sealant, suitable and as reviewed by the Architect.
 4. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ASA B 2.1 for tapered pipe threads.
 5. Joint compounds shall be smoothly placed on male thread and not in fittings. Threaded joints shall be installed tight with tongs or wrenches and caulking of any kind is not permitted. Failed joints shall be replaced with new materials. Installation of thread cement or caulking to repair a leaking joint is not permitted.
 6. Sharp-toothed Stilson, or similar wrenches, is not permitted for the installation of brass pipe or other piping with similar finished surfaces.
- E. Copper Tubing and Brass Pipe with Threadless Fittings:
1. Silver brazed joints shall be used for attaching fittings to non-ferrous metallic refrigerant piping.
 2. Non-pressure gravity fed condensate lines may be soldered with 95/5 solder
 3. Silver brazing alloy, Class BCUP-5. Surfaces to be joined shall be free of oil, grease, and oxides. Socket of fitting and end of pipe shall be thoroughly cleaned with emery cloth and wiped to remove oxides. After cleaning and before assembly or heating, flux shall be installed to each joint surface and spread evenly. Heat shall be applied in accordance with instructions in the Copper Tube Handbook issued by Copper Development Associates. Joints constructed of rough bronze fittings shall be provided as recommended by manufacturer.

4. Do not overheat piping and fittings when installing silver brazing.
 5. Joints in non-ferrous piping for services not covered above, shall be installed with solder composed of 95-5 tin-antimony, ASTM B32, Grade 5A. Surfaces to be jointed shall be free of oil, grease, and oxides. Sockets of fitting and end of pipe shall be thoroughly cleaned with emery cloth to remove oxides. Solder flux shall be sparingly installed, and solder added until joint is completely filled. Do not overheat. Excess solder, while plastic, shall be removed with a small brush in order to provide an uninterrupted fillet completely around joint. Random inspection of joints shall be conducted by PI to ensure joints are lead-free.
 6. Grooved end joints for copper piping shall be assembled in accordance with the latest Victaulic recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic.
- F. Ring-Type Pipe: Joints shall be installed in accordance with manufacturer's instructions with grooved couplings, fittings and rubber rings. Couplings and pipe shall be compatible and of the same manufacturer. Rings shall be accurately located and installed by grooves in coupling. Pipe shall be installed with zero deflection unless otherwise specified. Pressure pipe shall be furnished with thrust blocks at each offset point.
- G. Grooved End Pipe Joints: Grooved end joints for carbon steel piping shall be assembled in accordance with the latest Victaulic recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic.
- H. Valves: Valves shall conform to the following:
1. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.
 2. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.
 3. Globe valves of disc type shall be furnished with composition disc suitable for service on which installed.
 4. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.

5. Provide chain operators on valves 2 inches and larger located 7 feet or more above the servicing floor level.
6. Valves for similar service shall be of one manufacturer.
7. Except where otherwise specified, valves shall be Victaulic, Stockham, Crane, Jenkins, Milwaukee, Hammond or American, Nibco, Hoffman
8. Ball valves below grade in yard boxes shall have stainless steel handles.
9. Furnished hose bibs in dense garden areas shall be 3/4 inch in size with 1 hose bib in the lunch pavilion 1 inch in size. Other furnished hose bibs, unless otherwise noted or specified, shall be 3/4 inch lock shield type. Bibs shall be furnished with vacuum breaker protection.
10. Safety valves and pressure relief valves shall have stamp of approval as required by ASME and shall be provided with annual test lever. Where a hot water storage tank is heated by means of a coil, pressure relief valve shall have a steam BTU discharge rating of the coil. Discharge pipe from safety or pressure relief valves shall be not less than one pipe size larger than inlet pipe size of valve. Discharge pipe shall terminate as indicated and shall be free of traps. In addition to locations specified, pressure relief valves shall be installed in the following locations:
 - a. On discharge side of each pressure-reducing valve.
 - b. On each water heater connected to a hot water storage tank and other pressure vessels.
 - c. On cold water line to each water heater or hot water storage tank when there is a check valve, backflow prevention valve or similar device between water heater or hot water storage tank and meter or relief valve at the pressure reducing valve assembly.
 - d. On discharge side of each air compressor.
 - e. On each air receiver connected to an air compressor.
11. Temperature relief valves and combination temperature and pressure relief valves shall be as specified and furnished as set forth in this section. Discharge pipe from relief valves shall be not less than discharge area of valve or valves it connects, based on discharge area of valves, and shall terminate as indicated and free of any traps. Valves shall be installed at following locations:

- a. A combination temperature and pressure relief valve or combination of valves on each hot water storage tank. Temperature sensing element shall extend into water inside tank.
 - b. A combination pressure and temperature relief valve on each water heater not connected to a storage tank. Temperature sensing element shall extend into water inside heater tank. This valve shall be required in addition to any relief valve installed on cold water line.
- 12. Manual air vent valve assemblies shall be installed at each high point of hot water space heating and chilled water piping systems. Valves shall discharge through 1/4-inch diameter copper tubing and drain to nearest floor sink. Automatic type air vent valve shall only be installed where specifically indicated. Radiator, convectors, and finned pipe convectors shall be fitted with packless radiator valves, angle or straight pattern. Each convector or radiator installed as part of a space hot water heating system shall be furnished with a manual-type air vent valve.
- I. Strainers: Strainers shall be installed on each water main downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange or groove type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, or equal.
- J. Hangers and Supports:
 - 1. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.

2. Hose faucets, compressed air outlets, and similar items at ends of pipe branches shall be rigidly fastened to building construction near point of connection.
3. Piping shall not be supported by wire, rope, wood, plumbers' tape, or other non-recognized devices.
4. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of 5, based on ultimate tensile strength of material installed.
5. Burning or welding of any structural member under load is not permitted. Field welding not specified on Drawings or reviewed Shop Drawings is not permitted without review by Architect and DSA.
6. Burning holes in beam flanges or other structural members is not permitted without review by the Architect and DSA.
7. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between covering and hanger. Installing hangers directly on pipe and butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.
8. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Tolco, Carpenter and Patterson, or Fee and Mason, as follows:
 - a. Tolco I beam, Fig.62 for maximum 1000 lbs.
 - b. Tolco I or WF beam, Fig. 329, for maximum of 1290 lbs.
9. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Tolco, Carpenter and Patterson, or Fee and Mason, as follows:
 - a. Tolco Fig.310 for maximum of 600 lbs.
 - b. Tolco Fig. 309 for maximum of 1140 lbs.
10. For fastening to wood ceilings, beams, or joists, furnish Grinnell figure 128 or 202 pipe hanger flange fastened with drive screws. Under wood floors, 3/8-inch hanger rods shall be hung from 2 inch x

2 inch x 1/4 inch angle clips 3 inches long, with 2 staggered 10d nails, clinched over joist.

11. Hanger rod sizes for copper, iron, or steel pipe: 3/8 inch for pipe sizes 1/2 inch through 2 inches, 1/2 inch for pipe sizes 3 inches, 4 inches and 5 inches, 5/8 inch for pipe size 6 inches, and 3/4 inch for 8 inches and 10 inches pipe.
12. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.
13. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.
14. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8-inch-thick rubber, neoprene, or soft resilient cloth.
15. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.
16. Vertical Piping:
 - a. Vertical pipe risers shall be securely supported with riser clamps of recognized type. Risers in reinforced concrete buildings shall be furnished with extension clamps fastened to pipe above each concrete floor slab with extended arms of clamp to rest on slab. Clamps shall be provided with lead or Teflon liners when installed on copper tubing. Clamps shall be plastic-coated when installed on non-ferrous pipe or tubing.
 - b. Copper tubing in sizes 1-1/2 inches and larger and steel pipelines passing up through building shall be supported at each floor of building or every 15 feet whichever is less.
 - c. Copper tubing sizes 1-1/4 inches and smaller shall be supported at not intervals not more than 6 feet on center. Special provisions shall be installed for vertical lines subject to expansion and contraction caused by operating temperature differences.
 - d. Vertical cast iron pipelines shall be supported from each floor and at its base. Malleable iron or steel pipe clamps with minimum thickness of 1/4 inch shall be furnished and fastened around pipe for support.

17. Horizontal Piping:

- a. Pressure piping on roofs shall be supported from stands, trapezes, or structures so that the bottoms of pipes clear the roof surface by 10 inches.
- b. Insulated steam, space heating hot water, insulated condensate lines, insulated domestic hot water supply and return piping shall be supported with Tolco figure 4 steel hangers with welded eye rods to permit hinge movement at point of attachment of hangers. Hinge movement at point of support shall be provided by welded eye linked rods Tolco figure 101L.
- c. Domestic cold water piping, chilled water supply and return piping, condenser water piping, insulated refrigerant piping, gas piping, compressed air piping, cast iron soil piping, galvanized steel vents, waste and downspout piping and glass may be supported with Tolco figure 1 or equal hangers with rods, turnbuckles and inserts suitable for above hangers.
- d. Maximum hanger and support spacing shall conform to CPC schedule for horizontal piping installed above grade.

18. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.

19. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

20. In systems where grooved piping is used, couplings shall be provided with angle pattern bolt pads to comply with support and hanging requirements of ANSI B31.1, B31.9 and NFPA-13.

K. Flashings:

1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.
2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through a roof shall be 4-pound soft sheet lead. Flashing and flanges for ducts and heater vents passing through exterior walls shall be 22 gage sheet metal. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct. No soldered joints on roof flashings will be allowed.

3. Lead flashing and flanges shall be constructed of 4-pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out onto roof a minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 7 inches.
 4. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2-1/2 inches. Flanges on gas-fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per National Fire Code, Pamphlet 211-1105.
 5. Cast iron, steel, brass, and copper pipe, which terminates less than 18 inches above roof, shall be furnished with a combination counterflashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter-flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.
 6. Counterflashing and combination counter-flashing sleeves and vandal-proof hoods shall be cast iron, vandal-proof, threaded, caulked or approved gas-heated sleeve type. Counter-flashing sleeves on each of these items shall extend down over flashing a minimum of 3/4 inch.
 7. Flashing and flanges on ducts shall be installed waterproof at point of connection to the duct by riveting and soldering. Storm collars shall be securely screwed and installed waterproof around appliance vent pipe immediately above flashing.
 8. Vent piping above roof shall be furnished with a combination counter-flashing sleeve and vandal-proof hood.
- L. Equipment Installation: Install roof or floor mounted equipment on level platforms, housekeeping pads or curbs and provide sound, vibration and seismic control measures per Section 15070, unless indicated otherwise whether indicated on drawings or not

END OF SECTION 23 05 13

Part 1 GENERAL

1.01 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.
- B. See Division 15 Section "Mechanical Sound Vibration Control" for vibration isolation supports and hangers and seismic restraints.

1.02 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.03 SUBMITTALS

- A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.
- C. Welding certificates.

1.04 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and seismic restraint by a qualified professional engineer.

Part 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - (1) Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

- (2) Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components.

- (1) All products used must have an ICC or other recognized report, as included by DSA form IR A-5. Excerpt below.
 - a **ACCEPTANCE OF STRUCTURAL PRODUCTS:** Structural products and materials, as described in the Scope section of this IR, may be accepted for use on DSA projects if they meet the following requirements:
 - 1)** Products, including alternate materials, must have a valid evaluation listing/report issued by a recognized evaluation agency (see Section 3 below).
 - 2)** In addition to valid listings, products that are prescribed in CBC and its adopted standards, including DSA IRs or Bulletins, shall comply with those prescribed requirements.
- (2) Manufacturers:
 - a AAA Technology and Specialties Co., Inc.
 - b B-Line Systems, Inc.
 - c Carpenter & Patterson, Inc.
 - d Empire Tool & Manufacturing Co., Inc.
 - e Globe Pipe Hanger Products, Inc.
 - f Grinnell Corp.
 - g GS Metals Corp.
 - h Michigan Hanger Co., Inc.
 - i National Pipe Hanger Corp.
 - j PHD Manufacturing, Inc.
 - k PHS Industries, Inc.
 - l Piping Technology & Products, Inc.

- (3) Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
 - (4) Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
- (1) Manufacturers:
 - a B-Line Systems, Inc.
 - b Grinnell Corp.
 - c GS Metals Corp.
 - d Michigan Hanger Co., Inc.
 - e National Pipe Hanger Corp.
 - f Thomas & Betts Corp.
 - g Unistrut Corp.
 - h Wesanco, Inc.
 - (2) Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
 - (3) Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.
- (1) Manufacturers:
 - a Carpenter & Patterson, Inc.
 - b Michigan Hanger Co., Inc.
 - c PHS Industries, Inc.
 - d Pipe Shields, Inc.
 - e Rilco Manufacturing Co., Inc.
 - f Value Engineered Products, Inc.

- (2) Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
- (3) Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
- (4) For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
- (5) For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
- (6) Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.03 MISCELLANEOUS MATERIALS

- A.
- B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- C. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
 - (1) Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
 - (2) Properties: Non-staining, non-corrosive, and nongaseous.
 - (3) Design Mix: 5000-psi, 28-day compressive strength.

Part 3 EXECUTION

3.01 APPLICATIONS

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - (1) Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30. Refer to detail 1/M3.1 and structural calculations.

- D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
- (1) Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
- (1) Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
- (1) Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 - (2) Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - (3) Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - (4) C-Clamps (MSS Type 23): For structural shapes.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
- (1) Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

3.02 INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes. Support pipes of various sizes together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
- F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- K. Insulated Piping: Comply with the following:
 - (1) Attach clamps and spacers to piping.
 - a Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c Do not exceed pipe stress limits according to ASME B31.9.
 - (2) Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

- (3) Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
- (4) Shield Dimensions for Pipe: Not less than the following:
 - a NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b NPS 4: 12 inches long and 0.06 inch thick.
 - c NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
- (5) Pipes NPS 8 and Larger: Include wood inserts.
- (6) Insert Material: Length at least as long as protective shield.
- (7) Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.03 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Place grout under supports for equipment and make smooth bearing surface.

3.04 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - (1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - (2) Obtain fusion without undercut or overlap.
 - (3) Remove welding flux immediately.
 - (4) Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.06 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils. See Division 9 Section 09900 Painting for paint materials and application requirements.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 05 29

MECHANICAL SOUND, VIBRATION AND SEISMIC CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Reduction or elimination of excessive noise or vibration within building due to operation of equipment, machinery, piping, and ductwork as specified.
 - 1. Vibration isolators.
 - 2. Seismic restraint devices.
 - 3. Lining and enclosing ductwork.
 - 4. Flexible ducts, conduits and piping.

1.02 GENERAL REQUIREMENTS

- A. Provide vibration isolators to eliminate or reduce the transmission of vibration noise to any part of building and mitigate vibration frequency and load imposed by equipment. Vibration isolators, base frames, inertia bases and seismic restraints shall be of sufficient size, flexibility and load distribution configuration to assure that deflection, stability and seismic restraint requirements are met without permitting excessive movement when starting. For typical units, no fewer than four isolators shall be provided. Isolators shall be provided to deflect uniformly under operating gravity and equipment thrust loadings to within $\pm 10\%$ of specified deflection values.
- B. Static deflections specified are based on the anticipated equipment characteristics. In the event the equipment proposed by the Contractor has characteristics other than those indicated, particularly the rated rpm, the static deflection shall be re-evaluated, and the proper mountings and other devices shall be provided.
- C. Where fabricated vibration isolator units are indicated, furnish manufacturer's standard catalog products with printed loading ratings or certified submittals
- D. Seismic Requirements:
 - 1. Refer to Guidelines for Seismic Restraints of Mechanical Systems as shown on the structural drawings, for minimum seismic restraints

required on mechanical components design and construction details.

2. Provide seismic restraints for mechanical equipment or components specified. Where equipment is specified with proprietary names, design for seismic restraints is for first proprietary name listed.
3. Provide restraints, bracing and anchorage as required for the mechanical equipment, electrical equipment and components specified in the Contract Documents. Restraints, bracing and anchorage shall be installed to resist the total design earthquake or wind loads in any direction in accordance with CBC Code and SMACNA guidelines.
4. Provide restraints, bracing, and anchorage for the mechanical equipment and components.
5. For rigidly mounted liquid filled steel pipe, comply with the following:
 - a. Provisions of NFPA Pamphlet 13, Section 3 for sway bracing.
 - b. Provisions of NFPA Pamphlet 13, Section 3 for earthquake protection.
 - c. Hanger spacing as specified in Section 15050 under Hanger Spacing Schedule.
 - d. SMACNA Guidelines for Seismic Restraints, of Mechanical Systems and Plumbing Piping and approved by DSA.
6. For flexibly mounted liquid filled steel pipe, comply with the following:
 - a. Provisions of the California Building Code for flexibly mounted equipment.
 - b. Provisions of VISCMA (Vibration Isolation and Seismic Control Manufacturer's Association) Seismic Control Device Installation, Best Practices Manuals.
 - c. Installer may provide a DSA or OSHPD approved system such as the SMACNA Guidelines with Addendum No. 1, the Mason Industries Seismic Restraint Guidelines or other proprietary pre-approved system.
7. For ductwork and other mechanical equipment restraints, comply with SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems and approved by DSA.

1.04 SUBMITTALS

- A. Provide in accordance with Division 01.
 - 1. Catalog cuts and data sheets on specific vibration isolators, seismic restraints, and anchors demonstrating compliance with the Specifications.
 - 2. Shop Drawings for each piece of equipment including dimensions, structural member size, support point, vibration, and seismic restraints.
 - 3. Written approval of frame design to be furnished by the equipment manufacturer.
 - 4. Drawings indicating methods for suspension, support, seismic restraints, guides, etc., for piping, ductwork, etc.
 - 5. Drawings indicating methods for isolation of pipes, ducts etc., piercing slabs, beams, etc.
- B. Vibration Test Reports: At completion of installation, submit the following documents. Submission of these documents must be complete before final acceptance of vibration isolation systems is given. Assistance from the vibration isolation equipment Manufacturer may be required.
 - 1. Complete tabulation showing for each vibration isolator:
 - a. Actual static deflection measured at the project.
 - b. Specified minimum static deflection.
 - 2. Report certifying:
 - a. Each piece of operative rotating mechanical equipment does not exceed the specified vibration displacement level.
 - b. Each piece of isolated equipment or equipment component (ducts, pipes, conduit, etc.) is not short-circuited by any means.
 - c. Requirements of section 2.00 are satisfied for all equipment.

1.05 QUALITY ASSURANCE

- A. Standards and Codes: Comply with applicable codes and standards having jurisdiction including, but not limited to:

1. NFPA, Pamphlet 13.
 2. ASHRAE Systems Handbook.
 3. SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems.
 4. CBC.
 5. VISCMA Seismic Control Device Installation, Best Practices Manuals.
- B. Qualifications of Manufacturer and Installers: Comply with provisions as set forth in Section 15010: Basic Mechanical Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Furnish and install vibration dampers, sound isolation pads, flexible connections and similar equipment required to prevent sound of water flowing in pipes, vibration of motors, and motor operated equipment from being transmitted to building structure; and, in case of fans, from being transmitted along ducts. Hot, tempered, and cold water lines shall be isolated from hangers, clamps and structural members by furnishing a commercially manufactured assembly of a hair felt or neoprene pad, cemented in a galvanized iron sleeve. Piping shall be isolated from vibrating equipment by furnishing required flexible connectors.
- B. Excepting sump pumps and in-line circulating pumps, pumps and similar motor operated equipment shall be installed on anti-vibration units.
- C. Fans, except curb-mounted roof-type exhaust fans and wall mounted propeller fans, shall be installed with anti-vibration units, whether indicated on Drawings or not. Fans built into air handling units may be furnished with independent anti-vibration mountings or whole unit may be installed on an external vibration isolation system.
- D. Other equipment shall be installed on anti-vibration bases, pads, or hangers, unless specifically noted otherwise on Drawings. Package units, furnished with built in anti-vibration bases, do not require unit bases unless otherwise specified.
 1. Unless specified otherwise, anti-vibration bases shall be Mason, M.W. Sausse/Vibrex, of the Model Number specified or indicated on the drawings or equal by Mason or Korfund. Furnished base including sub-base, shall be manufactured by same company with fan and integral motor base. Seismic restraints may be incorporated into bases or furnished separately.

2. Inertia anti-vibration bases shall conform to requirements indicated.
3. Unless noted otherwise, furnished anti-vibration bases, including supporting units for inertia bases, shall be of the spring type.
4. Selection of bases or supporting units shall be in accordance with manufacturer's recommendations based on following installed minimum effective isolation efficiencies (where not provided with each piece of equipment):
 - a. Centrifugal fans, packaged fan and coil units and cooling towers, less than 800 RPM 80 percent
 - b. Centrifugal fans over 800 RPM 90 percent
 - c. Centrifugal pumps 95 percent
 - d. Reciprocating compressors 95 percent
- E. Flexible duct connections shall be provided at inlet and outlets of each fan or HVAC unit, except curb-mounted roof exhaust fans whether indicated on the drawings or not.
- F. Flexible pipe or conduit connections shall be provided at piping and conduit connections to HVAC units, pumps, compressors and other moving (reciprocating or rotating) mechanical or electrical equipment provided under this section whether indicated on the drawings or not.
- G. Flexible connections for freon piping shall be seamless flexible metal hoses of type and length recommended by manufacturer and suitable for system operating pressure.
- H. Flexible connections for all other piping shall be flexible metal hose or spool type with flanged ends, unless otherwise specified. Metal hose shall be covered with protective braiding in areas where physical abrasion may occur, or for personnel safety.
- I. Spool types shall be similar to American Rubber Co., Mercer Rubber Co PROCO, and hose types shall be similar to D.M.E., Inc., U.S. Flex, Pennflex, Anaconda Flexpipe or Keflex with any required modifications to meet specified requirements. Flanges shall be furnished with steel retaining rings. Units installed on discharge side of pumps shall be furnished for a suitable working pressure of not less than 100 psig, and those on suction side for working pressures of 50 psig or 30 inches Hg vacuum.
- J. Units installed in cold water lines (less than 125 degrees F.) shall furnish a minimum temperature rating of 180 degrees F. and those installed in hot water lines (above 125 degrees F.) shall be constructed of special heat

resistant materials and be furnished for a minimum temperature rating of 220 degrees F., continuous operation. Units shall be able to withstand a maximum lateral deflection of 3/8 inch. Temperature and pressure ratings shall be molded into body of each spool unit, so they are easily identified. Spool types shall be for straight in flow only.

- K. Spool type units shall be furnished with control units comprised of a minimum of 2 tie-rods and anchor plates or internal guide sleeves to prevent excessive elongation or misalignment. Rubber washers shall be provided under bolt heads and rubber grommets in bolt holes to prevent any metal to metal contact between bolts and flanges.
- L. Where hose type units are furnished, restraining anchors or braces shall be provided if excessive or undesirable pipe movement occurs when system is operated.

2.02 GENERAL PROPERTIES OF VIBRATION ISOLATORS.

- A. Shall be provided with markings so that, after adjustment, when carrying their load, deflection under load can be verified; thus determining that load is within proper range of device and that correct degree of vibration isolation is being provided according to the design.
- B. Isolators to operate in direct proportion to their load versus deflection curve. Load versus deflection curves shall be furnished by manufacturer and must be linear over a deflection range of 50 percent above design deflection.
- C. Wave motion through isolator shall be reduced to following extent: Isolation above resonant frequency shall follow theoretical prediction based upon an un-dampened single degree of freedom system with a minimum isolation of 50 decibels above 150 cycles per second.
- D. Vibration isolator spring diameters shall be no less than their deflected height. Furnish spring with a 50 percent overload safety factor.
- E. Unless otherwise indicated, equipment installed on vibration bases shall provide a minimum operating clearance of one inch between structural steel base and floor or support base. Provide flexible connectors in piping and flexible conduit in power wiring to minimize transmission of vibration.
- F. Isolators and springs exposed to weather shall be hot-dipped galvanized or powder coated after fabrication and before installation. Hot-dipped zinc coating shall be not less than 2 ounces per square foot by weight complying with ASTM A123. In addition, provide limit stops to resist wind velocity.

- G. Where indicated, provide structural steel bases with height saving brackets, and minimum of 3 points of support. Isolators shall be furnished with a method for leveling.
- H. Design isolators and seismic restraints for positive anchorage against uplift and overturning.
- I. Provide and install, under this section of the Specifications, structural steel required to properly support equipment and steel required to support horizontal thrust arrestors.

2.03 ISOLATOR TYPES

- A. Type A: Steel Spring Isolators: Un-housed steel spring isolators, laterally stable and unrestrained. Design springs so that ratio of horizontal to vertical spring (stiffness) constant is between 0.9 and 1.3. Natural frequency of isolator must be 1/3 to 1/4 of driving frequency that is to be controlled. Isolators to provide a minimum additional travel to solid equal to 50% of rated deflection. Isolators shall be furnished with built-in leveling bolts complete with sound isolation pads type B. Static deflection as specified.

2.04 B. EQUIPMENT FRAMES

- A. Type B Frame: Channel members, rigidized structural steel frame with brackets. Frame to be constructed of channel steel with section depth equal to 1/10th length of longest structural member. Frame shall be M.W. Sausse type RMSB-C or equal by Mason Industries.
- B. Type C Frame: Steel gusset or bracket welded or bolted directly to machine frame in order to accommodate isolator. Frame shall be M.W. Sausse type RMSG or equal by Mason Industries.

2.05 MATERIALS AND CONSTRUCTION

- A. Duct Liner: As indicated in Section 15080: Mechanical Insulation.
- B. Flexible Ducts: As indicated in Section 15080: Mechanical Insulation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide isolators, flexible pipe connectors, flexible electrical conduit and flexible duct connectors at all moving mechanical system components to prevent transmission of vibration noise to any part of building whether indicated on the drawings or not.
- B. Install isolators to suit imposed load and the vibration frequency to be absorbed. Isolator units shall furnish adequate strength and flexibility to

exhibit proper resiliency under machine load and impact without permitting excessive movement when starting.

- C. Where commercial vibration isolator and seismic restraint units are specified, furnish manufacturer's standard catalog products with printed loading ratings, or provide substantiating calculations.
- D. Install vibration isolators and seismic restraints in accordance with manufacturer's printed installation instructions.
- E. Where equipment is belt driven and motor is not installed on equipment, install motor, and driven equipment on unitized support, and install entire support isolators. Unitized support to be provided with adjustable slide rails sized for motor weight and frequency. Support shall be Mason Industries type WF, M.W. Sausse type RMSF, or equal.
- F. Do not install any equipment, piping, conduit, ductwork, etc., that makes rigid contact with building or its structural members, unless reviewed by the Architect.
 - 1. Coordinate Work with other trades to avoid rigid contact with building.
 - 2. Correct, before installation, any conflict with other Work that would result in solid contact to equipment or piping due to inadequate space.
 - 3. Obtain inspection from the PI for concealed Work before enclosure.
 - 4. Notify manufacturer before installation of vibration isolation devices so that manufacturer may instruct and demonstrate technique for proper installation.
- G. The furnishing or installation of vibration isolators must not cause any change of position or alignment of equipment, ductwork, or piping, resulting in stresses in piping or ductwork, connections, or misalignment of shafts or bearings. Equipment, piping, and ductwork shall be maintained in a rigid position during installation. Load shall not be transferred to isolator until installation is complete and under full operational load.
- H. Air Compressors, Water Chillers, Pumps, Vacuum Pumps, Boilers with Integral Combustion Fans and Miscellaneous Equipment, mounted on roof or raised floors: Install each unit with its motor on a vibration isolated base utilizing type B frames except where a type D frame is indicated on Drawings. Install steel support frame furnished by equipment manufacturer, utilizing equipment anchor bolt templates and isolator height saving brackets. Provide springs as specified for type "A" isolator; static deflection shall be minimum of 2 inches.

- I. Fans (2000 rpm or higher) Air Compressors, Vacuum Pumps, Miscellaneous Equipment, mounted on grade: As specified for grade mounted boilers except furnish type C isolators.

NOTE TO ARCHITECT: PROVIDE HOUSEKEEPING PAD DETAILS ON DRAWINGS

- J. Boilers mounted on grade: Install each unit on concrete housekeeping pad with sound isolation pad designed for applicable equipment loading. Unit shall be fastened to housekeeping pad to prevent any movement.
- K. Air Handling, Air Conditioning Units, Floor Mounted Fans, and Cabinet-Installed Fans: Install entire casing including filters, mixing box, fan section, coil sections, etc., on a continuous, integral, structural steel base, as indicated. Furnish type A, B, or C frames, reinforced as necessary to prevent distortion of frame. Furnish isolator type A; static deflection shall be a minimum of 1-1/2 inches
- L. Suspended Fans and Air Conditioning Unit Fan Coils and Unit Ventilators: Suspend each integral unit from overhead structure on steel spring and elastomer hanger isolators. Support deflection under rated load of 3/8 inch. Provide spring static deflection as follows:

Fan RPM	Min. Deflection
200 – 400	3 inches
400 – 700	2 inches
Above 700	1 inch

- M. Pipe Isolation: Where indicated and as required, furnish and support each pipe from an isolator. Isolator for the first 5 support locations away from vibrating equipment shall have the same deflection as the equipment isolators. After that, isolators shall be a neoprene-in-shear type of size as recommended by manufacturer; except where indicated on Drawings, pipe hanger rod shall be furnished with a steel spring isolator and elastomeric element, with lower rod capable of 30 degrees total misalignment without contact on spring housing.
- N. Seismic Restraints: Floor or pad mounted equipment that do not require vibration isolators, shall be bolted to floor or other support. Floor mounted equipment with vibration isolators shall be provided with lateral and vertical restraining devices on all sides of base to restrict displacement of equipment. On all sides of suspended equipment, provide bracing for rigid supports and provide aircraft cable restraints for resiliently supported equipment.

- O. Ductwork, duct acoustical lining, manual volume dampers and flexible ducts: Do not reduce length of duct runs, duct acoustical lining, manual volume dampers and flexible ducts for economy.
- P. Installation of flexible ducts at air inlets and outlets: Do not attach flexible ducts directly to air inlets and outlets unless a straight, smooth and uniform air flow can be achieved with sufficient space to make an elbow with a radius of at least three times the diameter of the duct. If sufficient space is not available to make such an elbow, provide a rigid elbow or a lined plenum.
- Q. Placement of Air Devices: Do not relocate air devices without the Architect's approval.

3.02 EXAMINATION

- A. Arrange for the services of a certified representative of isolation manufacturer to visit the Project site for inspecting installation of devices. In the event the isolators do not meet specified requirements perform necessary revisions. Submit a written report to the Architect signed by above representative indicating all devices are properly installed and are operating as specified or required by isolation manufacturer.

END OF SECTION

Part 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - (1) Equipment nameplates.
 - (2) Equipment markers.
 - (3) Equipment signs.
 - (4) Access panel and door markers.
 - (5) Pipe markers.
 - (6) Duct markers.
 - (7) Valve tags.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.03 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

Part 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
 - (1) Data:
 - a Manufacturer, product name, model number, and serial number.
 - b Capacity, operating and power characteristics, and essential data.
 - c Labels of tested compliances.

- (2) Location: Accessible and visible.
 - (3) Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Provide holes for mechanical fasteners.
 - (1) Terminology: Match schedules as closely as possible.
 - (2) Data:
 - a Name and plan number.
 - b Equipment service.
 - c Design capacity.
 - d Other design parameters such as pressure drop, entering and leaving conditions, and speed.
 - (3) Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
 - (1) Data: Instructions for operation of equipment and for safety procedures.
 - (2) Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
 - (3) Thickness: 1/16 inch, unless otherwise indicated.
 - (4) Fasteners: Self-tapping, stainless-steel screws.
- D. Access Panel and Door Markers: 1/16-inch- thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch hole, in each corner for attachment.
 - (1) Fasteners: Self-tapping, stainless-steel screws.

2.02 PIPING IDENTIFICATION DEVICES

- A. Do not use pipe markers or plastic tapes for bare pipes conveying fluids at temperatures of 125 deg F (52 deg C) or higher.

- B. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
 - (1) Colors: Comply with ASME A13.1, unless otherwise indicated.
 - (2) Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 - (3) Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 - (4) Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 - (5) Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- C. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

2.03 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme. Provide 5/32-inch hole for fastener.
 - (1) Material: 0.032-inch- thick brass.
 - (2) Valve-Tag Fasteners: Brass beaded chain.

Part 3 EXECUTION

3.01 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.02 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten nameplates on each major item of mechanical equipment that does not have a nameplate or has a nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

- (1) Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
 - (2) Pumps, compressors, chillers, condensers, and similar motor-driven units.
 - (3) Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
 - (4) Fans, blowers, primary balancing dampers, and mixing boxes.
 - (5) Packaged HVAC central-station and zone-type units.
- B. Install equipment markers with self-tapping stainless steel screws on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
- (1) Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - (2) Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 - (3) Locate markers where accessible and visible. Include markers for the following general categories of equipment:
 - a Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b Meters, gages, thermometers, and similar units.
 - c Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
 - d Pumps, compressors, chillers, condensers, and similar motor-driven units.
 - e Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
 - f Fans, blowers, primary balancing dampers, and mixing boxes.
 - g Packaged HVAC central-station and zone-type units.
 - h Tanks and pressure vessels.

- i Strainers, filters, humidifiers, water-treatment systems, and similar equipment.
- C. Install equipment signs with self-tapping stainless steel screws on or near each major item of mechanical equipment. Locate signs where accessible and visible.
 - (1) Identify mechanical equipment with equipment markers in the following color codes:
 - a Green: For cooling equipment and components.
 - b Yellow: For heating equipment and components.
 - c Orange: For combination cooling and heating equipment and components.
 - (2) Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - (3) Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 - (4) Include signs for the following general categories of equipment:
 - a Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
 - c Pumps, compressors, chillers, condensers, and similar motor-driven units.
 - d Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
 - e Fans, blowers, primary balancing dampers, and mixing boxes.
 - f Packaged HVAC central-station and zone-type units.
 - g Tanks and pressure vessels.

- h Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

D. Install access panel markers with screws on equipment access panels.

3.03 PIPING IDENTIFICATION

A. Do not use pipe markers and tapes for bare pipes conveying fluids at temperatures of 125 deg F (52 deg C) or higher.

(1) Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

(2) Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:

(1) Near each valve and control device.

(2) Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

(3) Near penetrations through walls, floors, ceilings, and non-accessible enclosures.

(4) At access doors, manholes, and similar access points that permit view of concealed piping.

(5) Near major equipment items and other points of origination and termination.

(6) Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

(7) On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.04 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

(1) Valve-Tag Size and Shape:

- a Cold Water: 1-1/2 inches, round.
- b Hot Water: 1-1/2 inches, round.
- c Gas: 1-1/2 inches, round.

(2) Letter Color:

- a Cold Water: Black.
- b Hot Water: Black.
- c Gas: Black.

3.05 ADJUSTING AND CLEANING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.
- B. Clean faces of mechanical identification devices.

END OF SECTION 23 05 53

Part 1 GENERAL

1.01 SUMMARY

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
 - (1) Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
 - (2) Adjusting total HVAC systems to provide indicated quantities.
 - (3) Measuring electrical performance of HVAC equipment.
 - (4) Setting quantitative performance of HVAC equipment.
 - (5) Verifying that automatic control devices are functioning properly.
 - (6) Measuring sound and vibration.
 - (7) Reporting results of activities and procedures specified in this Section.

1.02 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. AMCA: Air Movement and Control Association.
- C. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.03 SUBMITTALS

- A. Strategies and Procedures Plan: Testing, adjusting, and balancing strategies and step-by-step procedures. Include a complete set of report forms intended for use on this Project.
- B. Certified Testing, Adjusting, and Balancing Reports: Prepared on approved forms certified by the testing, adjusting, and balancing Agent.

1.04 QUALITY ASSURANCE

- A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC.

- B. Certification of Testing, Adjusting, and Balancing Reports: Certify testing, adjusting, and balancing field data reports. This certification includes the following:
 - (1) Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
 - (2) Certify that testing, adjusting, and balancing team complied with approved testing, adjusting, and balancing plan and procedures specified and referenced in this Specification.
- C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."
- D. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.
- E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by the instrument manufacturer.

1.05 PROJECT CONDITIONS

- A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.
- B. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.06 COORDINATION

- A. Coordinate efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.07 WARRANTY

- A. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

- (1) The certified Agent has tested and balanced systems according to the Contract Documents.
- (2) Systems are balanced to optimum performance capabilities within design and installation limits.

Part 2 PRODUCTS (Not Applicable)

Part 3 EXECUTION

3.01 EXAMINATION

- A. Examine the Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
 - (1) Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."
- D. Examine equipment performance data, including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with design data and installed conditions.
- E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- F. Examine system and equipment test reports.
- G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are

properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

- H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- I. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible, and their controls are connected and functioning.
- K. Examine plenum ceilings, utilized for supply air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
- L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- M. Examine equipment for installation and for properly operating safety interlocks and controls.
- N. Examine automatic temperature system components to verify the following:
 - (1) Dampers, valves, and other controlled devices operate by the intended controller.
 - (2) Dampers and valves are in the position indicated by the controller.
 - (3) Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
 - (4) Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
 - (5) Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 - (6) Sensors are located to sense only intended conditions.
 - (7) Sequence of operation for control modes is according to the Contract Documents.
 - (8) Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

- (9) Interlocked systems are operating.
- (10) Changeover from heating to cooling mode occurs according to design values.

O. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.02 PREPARATION

- A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - (1) Permanent electrical power wiring is complete.
 - (2) Hydronic systems are filled, clean, and free of air.
 - (3) Automatic temperature-control systems are operational.
 - (4) Equipment and duct access doors are securely closed.
 - (5) Balance, smoke, and fire dampers are open.
 - (6) Isolating and balancing valves are open and control valves are operational.
 - (7) Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - (8) Windows and doors can be closed so design conditions for system operations can be met.

3.03 TESTING AND BALANCING PROCEDURES

- A. Perform testing and balancing procedures on each system according to procedures contained in AABC national standards.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
- C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.04 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

- (1) Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.
- (2) Air Outlets and Inlets: 0 to minus 10 percent.

3.05 REPORTS

A. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

B. Final Report: Typewritten, or computer printout in letter-quality font, on standard bond paper, bound in three-ring, loose-leaf binder, and tabulated and divided into sections by tested and balanced systems.

- (1) Include a certification sheet in front of binder signed and sealed by the certified testing and balancing agent.
- (2) Include a list of instruments used for procedures, along with proof of calibration.
- (3) Final Report Contents: In addition to certified field report data, include the following:
 - a Fan curves.
 - b Manufacturers' test data.
 - c Field quality-control test reports prepared by system and equipment installers.
 - d Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.
- (4) General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
 - a Title page.
 - b Name and address of testing, adjusting, and balancing Agent.
 - c Project name.
 - d Project location.

- e Architect's name and address.
- f Engineer's name and address.
- g Contractor's name and address.
- h Report date.
- i Signature of testing, adjusting, and balancing Agent who certifies the report.
- j Summary of contents, including the following:
 - 1) Design versus final performance.
 - 2) Notable characteristics of systems.
 - 3) Description of system operation sequence if it varies from the Contract Documents.
- k Nomenclature sheets for each item of equipment.
- l Data for terminal units, including manufacturer, type size, and fittings.
- m Notes to explain why certain final data in the body of reports vary from design values.
- n Test conditions for fans and pump performance forms, including the following:
 - 1) Settings for outside-, return-, and exhaust-air dampers.
 - 2) Conditions of filters.
 - 3) Cooling coil, wet- and dry-bulb conditions.
 - 4) Face and bypass damper settings at coils.
 - 5) Fan drive settings, including settings and percentage of maximum pitch diameter.
 - 6) Inlet vane settings for variable-air-volume systems.
 - 7) Settings for supply-air, static-pressure controller.
 - 8) Other system operating conditions that affect performance.
- (5) System Diagrams: Include schematic layouts of air distribution systems. Present with single-line diagrams and include the following:

- a Quantities of outside, supply, return, and exhaust airflows.
- b Duct, outlet, and inlet sizes.
- c Terminal units.
- d Balancing stations.

3.06 ADDITIONAL TESTS

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

Start-up Check Sheet

Owner Name: Fontana Unified School District Dealer Name: _____

Address: _____ Address: _____

City,State, Zip: _____ City,State,Zip: _____

Model Number: _____ Serial Number: _____

Date: _____ Technician: _____

Type of Unit Gas/Electric _____ Heat Pump _____

Supply Voltage L1-L2 _____ L2-L3 _____ L3-L1 _____

Compressor Amps L1 _____ L2 _____ L3 _____

Indoor-Fan Amps L1 _____ L2 _____ L3 _____

Blower Speed Checked? _____ Belt Alignment Checked _____

Calculated or Measured CFM: Heating _____ Cooling _____

Filter Size and Type _____ Belt Size _____

Temperature Split: Supply Air _____ DEG. F Return Air _____ DEG. F

Gas Inlet Pressure: _____ IN WG Gas Manifold Pressure: _____ IN WG (HI FIRE)

Refrigerant Suction: _____ PSIG Refrigeration Discharge: _____ PSIG

Date of Start-up: _____

Economizer

Model Number: _____ Serial Number: _____

Enthalpy Sensor Setting: _____

Powered Exhaust (Yes) (No) If so Amp draw _____ & Belt size _____

Date: _____ Technician: _____

END OF SECTION 23 05 93

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Supply and return air ducts for heating and cooling systems air ducts.
 - 2. Plumbing piping and equipment including hot and tempered domestic water supply and return piping.
- C. Related Sections:
 - 1. Section 15010: Basic Mechanical Requirements.
 - 2. Section 15050: Basic Mechanical Materials and Methods.
 - 3. Section 15075: Mechanical Identification.
 - 4. Section 15700: Heating, Ventilating and Air Conditioning Equipment.
 - 5. Section 15800: Air Distribution.

1.02 REFERENCES

- A. American Society for Testing and Materials International:
 - 1. ASTM C167 - Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
 - 2. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.
 - 3. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - 4. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 5. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

6. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
7. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
8. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
9. ASTM C739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.
10. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
11. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
12. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
13. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests.
14. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Underwriters Laboratories, Inc.:

1. UL 181 - Factory-Made Air Ducts and Air Connectors.
2. UL 723 - Test for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems .
2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
3. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

- A. Submit in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.
 - 1. Complete material list of items to be furnished and installed under this section.
 - 2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.
 - 3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.
 - 4. Display sample cutaway sections.
 - 5. Manufacturer's recommended method of installation procedures, which will become part of this Specification section.

1.04 QUALITY ASSURANCE

- A. Qualifications of Manufacturer and Installer, Workmanship and Standard of Quality: Comply with provisions stated under Section 15010: Basic Mechanical Requirements and Section 15050: Basic Mechanical Materials and Methods.
- B. Insulation Work shall be in accordance with the State of California Building Energy Efficiency Standards, CBC, and Uniform Mechanical Code.
- C. Test Ratings:
 - 1. Comply with provisions stated under Section 15010 and 15050 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or listing of satisfactory test results from the National Bureau of Standards, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.
 - 2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.
 - 3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.

4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.
- D. Regulatory Requirements: Insulation furnished and installed under this section shall meet minimum legal requirements of the Building Energy Efficiency Standards adopted and incorporated in the California Energy Commission, Title 24, Part 2, Chapters 2 through 53, unless otherwise noted, for the piping, ductwork, and equipment.
- E. All chemically based products such as sealers, primers, fillers, adhesives, etc. must meet the California air quality regulations.

1.05 PRODUCT HANDLING

- A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 15010: Basic Mechanical Requirements and 15050: Basic Mechanical Materials and Methods.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 1. Insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.
 2. Insulating material shall be furnished with thickness indicated in Table 1, and shall furnish thermal resistance in the range of R 4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.
 3. Asbestos in any quantity in insulating material is not permitted.
 4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:
 - a. Nylon anchors for installing insulation to ducts or equipment.
 - b. Treated wood blocks.
 5. Flameproofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)

Insulation Thickness Required (in inches)

Space Heating Systems (Steam, Steam Condensate and Hot Water)

Piping System Type	Temp. Range (degrees F)	Runouts up to 2 (2)	1 and less	1.25-2	2.5-4	5-6	8 and larger
Service Water Heating Systems (recirculating, piping supply and return)							
Hot Water	Up to 180	0.5	1.0	1.0	1.5	1.5	1.5
Space Cooling Systems (Chilled water, Brine and Refrigerant)							
Refrigerant/Brine	Below 40	1.0	1.0	1.5	1.5	1.5	1.5
Condensate Drain	1/2 inches Minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From Equipment:	A/C Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES: (1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(2) Runouts to individual terminal units, not exceeding 12 feet in length.

- B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.
- C. Canvas Jackets: Furnish 6 oz. in accordance with square foot minimum, 48 x 48 thread count canvas jacketing.
- D. Insulation Jackets:
 - 1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be

furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.

2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of 1/2 inch to 8 inches shall be provided with Childers aluminum Ell-Jacs insulation covers, or equal, manufactured from 1100 aluminum alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10 inches to 18 inches shall be provided with Childers 4-piece aluminum Ell-Jacs.
 3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, or equal.
- E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA Standard 90-A & 90-B and has been tested according to relevant ASTM requirements and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.
- F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, or equal.

2.02 DUCTWORK AND PLENUM INSULATION

- A. General: Insulate ductwork and plenums with not less than the amount of insulation tabulated in Table 4. Insulation may be omitted under the following conditions:
1. Exposed return air ductwork in conditioned space.
 2. Return air ductwork between wall studs inside an interior wall.

TABLE 4 - INSULATION OF DUCTS AND PLENUM

INSULATION TYPES

<u>Duct Location</u>	<u>Heating and Cooling</u>
On roof or exterior of building	L2
Attics, Garages, and Crawl Spaces	F-3 or L-2 See Note 3
In walls, within floor-ceiling spaces	F-1 or L-1 See Note 3
Hot and cold plenums	F-2 or L-2 See Note 3
Within unconditioned space or in basement	F-3 or L-2 See Note 3

B. Insulation Types:

1. F-1: 1 ½" blanket fiberglass, factory-laminated with all-service jacket vapor barrier.
2. F-2: 2 inch blanket fiberglass, factory-laminated with all service jacket vapor barrier.
3. F-3: 3 inch blanket fiberglass, factory-laminated with all service jacket vapor barrier.
4. L1: 1 inch internal duct lining. Flexible type for ducts and rigid board for plenums.
5. L2: 2 inch internal duct lining. Flexible type for ducts and rigid board for plenums. Duct joints shall be waterproofed.

C. Notes:

1. Minimum insulation provided shall be as required by the current CAC Title 24 for the most restrictive condition.
2. Refer to the materials indicated in this section for external insulation and internal lining, this section, below.
3. External insulation shall be replaced with internal duct lining (of equivalent thermal resistance value unless noted otherwise) where indicated on the drawings or specified elsewhere for sound attenuation.

4. Provide internal duct lining (1 inch unless noted otherwise) where indicated on the drawings or specified elsewhere for sound attenuation.

D. Materials:

1. Fire-Resistive Insulation Materials and Coatings: Submit State Fire Marshal pre-approved materials only.
2. Adhesives: See Article 2.01, E for applicable products.
3. External Insulation: Provide glass fiber blankets that are factory-laminated with reinforced foil Kraft (FRK) vapor barrier facing; Johns Manville Microlite, Owens Corning all-service faced duct wrap, Ultralite No. 100, Pittsburgh Plate Glass Superfine, or Silvercote Silvercel. Provide a minimum installed R value as required by the latest edition of the California Energy Efficiency Standards; but not less than scheduled below:

TABLE 5
INSULATION OF DUCTS AND PLENUM INSTALLED
THERMAL RESISTANCE "R" VALUES

Type	Labeled Thickness	Installed R Value (hr.ft ² .°F/Btu)
F1	1 ½"	4.2
F2	2"	5.6
F3	3"	8.3
L1	1"	4.2
L2	2"	8.3

4. Internal Lining: Johns Manville Permacote® Linacoustic ® and/or Permacote® Spiracoustic®, Owens Corning QuietR® acoustic duct liner and liner board, or equal. Internal lining shall conform to:
 - a. Fire Safety Standards: NFPA 90A and 90B.
 - b. Operating Temperature: ASTM C411.
 - c. Air velocity: ASTM C1071, UL 181.
 - d. Fire Hazard Classification: ASTM E84, UL 723-Class 1, NFPA 255.
 - e. Corrosion Resistance: ASTM C739 and ASTM C665.
 - f. Fungi Resistance: ASTM G21.
 - g. Water Vapor Sorption: ASTM C1104, less than 1% by weight.

- h. Formaldehyde, Phenolic Resins or other Volatile Organic compounds: 0%.
- i. Minimum R value as required by the latest edition of the California Energy Efficiency Standards, but not less than 4.0 at 75 degrees F.
- j. Acoustical Performance: ASTM C423 & ASTM E795 Minimum NRC of 0.75 for interior spaces Minimum NRC of 0.90 for exposed to weather.
- k. Hot and cold plenums separated by single partition: Minimum NRC of 0.75, both sides.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.
- B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.
- D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where firestop or firesafing materials are required.
- E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.
- F. Insulation shall not be installed in the following locations unless otherwise noted:
 - 1. On vacuum return lines less than 50 feet long.
 - 2. On unions, flanged connections or valve handles.

3. Over edges of any manhole, clean-out hole, clean-out plug, access door or opening to a fire damper, so as to restrict opening or identification of access.
4. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.02 INSTALLATION OF COOLING PIPING SYSTEM INSULATION

- A. General: Chilled water supply and return piping, refrigerant piping and condensate drain lines, after having been tested, shall be cleaned and insulated.
- B. Application: Insulation on chilled water lines, refrigerant suction lines and liquid lines, if indicated, and air conditioner interior drain lines shall be jacketed with fire-resistant vapor barrier of laminated aluminum foil consisting of 2 plies with glass-yarn reinforcing. Jacket joints shall be lapped and sealed with an approved adhesive. Insulation shall be secured with aluminum bands not less than 0.005 inch thick by 3/4 inches wide, spaced not over 12 inches on centers, or as recommended by manufacturer.
 1. Longitudinal Seams: Butt hinged sections of covering tightly together and seal down jacket flap with adhesive, or with factory-applied, self-sealing lap with pressure-sensitive sealer protected with release paper.
 2. End Joints: Wrap joint with a 3-inch wide (minimum) self-sealing tape.
 3. Fittings and Valves: Fittings and valves shall be covered with same material of same thickness as pipe insulation, sealed with an approved, vapor-sealing tape or compound and covered with Zeston polyvinyl-chloride cover.
 4. Pipe hangers shall be insulated or attached to pipe by an insulating insert, butted between adjoining insulation sections.
- C. Additional Jackets:
 1. Exposed Indoor Insulation: Cover with 26 gage galvanized sheet metal jacket to 8 feet above floors, except in mechanical equipment rooms and accessible pipe tunnels.
 2. Exposed Outdoor Insulation: In addition to canvas or fiberglass cloth cover, provide 0.016 inch thick aluminum jacket with one inch wide aluminum bands and seals. Install appropriate jackets on valves and fittings.

A. External Covering:

1. Before installing duct insulation, sheet metal ducts shall be clean, dry, and tightly sealed at joints and seams.
2. Duct exterior insulation shall be firmly wrapped around ductwork with joints lapped a minimum of 2 inches. Insulation shall be securely fastened with 18 gage copper-lined steel wire, or 16 gage soft-annealed galvanized wire spaced approximately 12 inches on centers and at loose ends, presenting a neat and workmanlike appearance. Where duct width is such that wiring will not fasten insulation firmly against duct an adhesive shall be furnished to fasten insulation to duct with wiring being installed at ends of insulation segment.
3. Duct insulation in finished rooms shall be covered with wrapped fiberglass cloth cover. Install on each corner of duct 26 gage galvanized steel small nose, wide flange corner bead of appropriate height. In unfinished rooms, the insulation shall have a vinyl or similar coating. In all rooms, insulation shall be fastened to the ducts with an approved adhesive instead of wire. Corners shall be cut and formed instead of bending the insulating material. Raw edges shall be taped.
4. Insulation on ductwork transporting conditioned air, both supply and return, and outside air intake ducts shall be furnished with a factory-applied, fire-resistant vapor barrier.
5. Exposed Ducts or Plenum:
 - a. Install insulation to ducts or plenum furnished with butt joints, without voids and with adhesive over entire surface of duct. Cover insulation with canvas jacket, fastened tightly to insulation with lagging adhesive. Install 2 finish coats of undiluted adhesive.
 - b. When installing jacket, finished covering shall be even and level, without humps, with constant diameters on round ducts maintained.
 - c. For non-lined insulated ducts or plenums exposed to weather: Insulation finish shall be 0.016 inch thick aluminum sheet with joints lapped not less than 3 inches, sealed, and secured with 6 gage by 3/8 inches

aluminum sheet metal screws, or aluminum handgun-type rivets.

B. Lining General:

1. Floors of cold plenums and fan enclosure plenums shall not be insulated.
2. Cover short damper sections on lined ducts on outside to permit free operation of dampers and linkage.
3. Dimensions of ducts indicated are net inside dimensions and must include thickness of duct liners to obtain the required duct size.
4. Install insulation in square turns, where required, to cover interior surfaces before duct turns are installed.

C. Interior insulation (lining) of ducts shall be as specified in above.

1. Liner material installed during fabrication of duct with sealed face only exposed to air stream. Insulation shall be fastened to sheet metal with an approved fire-retardant adhesive, with minimum 90 percent coverage and edges firmly adhered. Mechanical fasteners shall supplement the adhesive on top sections of ducts more than 12 inches wide and on sides of ducts more than 24 inches high and shall be spaced on 16-inch centers maximum. Fastener posts shall be cut off approximately 1/4 inch from metal disc.

D. Interior insulation in ducts or plenums shall not have exposed edges. Edges open to entering or leaving air streams shall be covered, secured in place and sealed with approved duct liner edge sealers.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION 23 07 00

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General requirements for Commissioning (Cx) of HVAC systems and equipment including installation, start-up, testing, documentation, and training according to the Construction Documents.
- B. Standard procedures for the execution of commissioning work shall be in conformance with Division 1, Section 01810 General Commissioning Requirements. Coordinate all work with the Commissioning Agent (CxA).

1.02 RELATED SECTIONS

- A. Related sections:
 - 1. Provisions of Division 01 apply to this Section.
 - 2. Section 01400: Quality Assurance / Quality Control
 - 3. Section 15990: Test and Balance.
 - 4. Section 01810: General Commissioning Requirements.
 - 5. Section 01820: Maintenance & Operations Staff Demonstration and Training.
 - 6. Section 15010: Basic Mechanical Requirements.
 - 7. Section 15738: Heating, Ventilation, and Air Conditioning Equipment.
 - 8. Section 15800: Air Distribution
 - 9. Section 15875: Carbon Monoxide Detection and Alarm Systems.
 - 10. Section 16010: Basic Electrical Requirements.
 - 11. Section 16050: Basic Electrical Materials and Methods.
 - 12. Section 16060: Grounding and Bonding.
 - 13. Section 16120: Low Voltage Wires (600 Volt AC).
 - 14. Project Commissioning Plan (CxP)

1.03 REFERENCES

A. Applicable codes, standards, and references: all inspections and tests shall be in accordance with the following applicable codes and standards, except as provided otherwise herein:

1. National Electrical Testing Association – NETA.
2. National Electrical manufacturer's Association – NEMA.
3. American Society for Testing and Materials – ASTM.
4. Institute of Electrical and Electronic Engineers – IEEE.
5. American National Standards Institute – ANSI.
6. National Electrical Safety Code – NESC.
7. California Building Code – CBC.
8. California Electrical Code – CEC.
9. California Mechanical Code – CMC.
10. Insulated Power Cables Engineers Association – IPCEA.
11. Occupational Safety and Health Administration – OSHA.
12. National Institute of Standards and Technology – NIST.
13. National Fire Protection Association – NFPA.
14. American Society of Heating and Air Conditioning Engineers – ASHRAE
(The HVAC Commissioning Process, ASHRAE Guideline).
15. Associated Air Balance Council – AABC
(National Standards for Total System Balance).
16. Uniform Mechanical Code – UMC.
17. Uniform Plumbing Code – UPC.

1.04 SUBMITTALS

A. Submittals package(s) shall include the following:

1. Commissioning required submittals in accordance with Division 01 Specification Sections.

2. Copy of the Architect's reviewed and accepted submittals to the CxA via the OAR.
3. List of team members who will represent the Contractor in the Pre-functional Equipment Checks (PEC) and Functional Performance Tests (FPT), at least six (6) weeks prior to the start of Pre-functional Equipment Checks.
4. Detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, a copy of full details of Owner-contracted tests, full factory testing reports, if any, and Warranty information, including responsibilities of Owner to keep Warranty in force clearly defined.
5. Installation and checklist documentation shipped with equipment and field checklist forms to be used by factory or field technicians.
6. Detailed manufacturer's recommended procedures and schedules for PECs, supplemented by Contractor's specific procedures, and FPTs, at least four (4) weeks prior to the start of PEC.

1.05 MEETINGS, SEQUENCING AND SCHEDULING

- A. Meetings: Attend the Cx meetings as required under Section 01810 and Cx Plan.
- B. Sequencing and Scheduling: The work described in this Section shall begin only after all work required in related Divisions 15 and 16 Sections has been successfully completed and all tests, inspection reports, and Operation & Maintenance manuals required have been submitted and accepted. The start-up and PEC shall be completed and submitted to the Owner at least two weeks prior to beginning FPT.
 1. Coordinate all HVAC work with the work of other trades prior to scheduling of any Cx procedures.
 2. Coordinate the completion of all HVAC testing, inspection, and calibration prior to start of Cx activities.

1.06 QUALITY CONTROL

- A. Comply with the Owner's Quality Control Specifications, sections 01400-01405.
- B. Incorporate manufacturer's recommended Cx procedures for the systems and equipment to be commissioned under this section.

1.07 EQUIPMENT AND SYSTEMS TO BE COMMISSIONED

- A. Split Systems
- B. Fan Coil Units
- C. Single Package Gas Heating Electric Cooling Units
- D. Wall Mount Heat Pump Units

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. Equipment to be utilized in the commissioning process shall meet the following requirements:
 - 1. Provide test equipment as necessary for the testing of the equipment and systems to be commissioned.
 - 2. Provide testing equipment and accessories that are free of defects and certified for use.
 - 3. Provide testing equipment with current calibration labels as per NIST Standards.
 - 4. Equipment shall be calibrated on the manufacturer's recommended intervals with calibration tags affixed to the instrument. In the absence of calibration tags, calibration documentation shall be submitted to the CxA at least thirty (30) days prior to use; this documentation shall include description and serial number of instrument and calibration data and date.
 - 5. All testing equipment shall be maintained in good operating condition for the duration of the project.

PART 3 – EXECUTION

3.01 COMMISSIONING PROCESS REQUIREMENTS

- A. Work to be performed prior to commissioning:
 - 1. Complete all phases of the work so the system(s) can be started, tested, adjusted, balanced, and otherwise commissioned.
 - 2. If modifications or corrections to the installed system(s) are required to bring the system(s) to acceptance levels due to Contractor's incorrect installation or defective materials, such modifications shall be made at no additional cost to the Owner.
 - 3. Normal start-up services required to bring each system into full

operational state:

- a. Testing, motor rotation check, control sequences of operation, full and part load performance.
- b. Commissioning shall not start until each system is complete and start-up has been performed.

B. Pre-Commissioning responsibilities:

1. Inspection, calibration and testing of the equipment required to commission the following systems:
 - a. HVAC System(s).

C. Commissioning Process Requirements:

1. Refer to Section 01810 General Commissioning Requirements and related sections for information on meetings, start-up plans, Pre-Functional and FPT, operations & maintenance data, training requirements, and other Cx activities.

3.02 PREPARATION

- A. Provide certified HVAC technicians as required, with tools and equipment necessary to perform all Cx activities specified.
- B. Provide certified testing agency personnel and equipment factory representatives as require in the Cx plan and other related sections.
- C. Verify that all work required in this section and in Section 01810 is complete prior to starting of FPT.
- D. Verify that complete operational manuals have been reviewed and accepted by the CxA as specified before starting FPT.

3.03 TESTING

- A. Testing procedures shall include the following minimum information:
 1. Test number.
 2. Equipment used for the test, with manufacturer and model number and date of last calibration.
 3. Date and time of the test.

4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 5. Identification of the system, subsystem, assembly, or equipment.
 6. Conditions under which the test was conducted, including (as applicable); ambient conditions, set points, override conditions, status, and operating conditions that impact the results of the test.
 7. Systems and assemblies test results and performance and compliance with contract requirements.
 8. Issue number, if any, generated as the result of the test.
 9. Name(s) and signature(s) of witnesses and the person(s) performing the test.
- B. Contractor shall participate and perform all Cx related testing requirements as specified.
- C. General Requirements for Mechanical, Controls, and Testing and Balance:
1. Construction and Acceptance Phases:
 - a. Provide assistance to CxA in preparing FPT procedures specified. Sample test forms are include in the project Cx Plan.
 - b. Develop full startup and initial checkout plan using manufacturer's start-up procedures and all Cx checklists for all commissioned equipment. Submit to CxA for review and approval prior to startup.
 - c. During startup and initial checkout process, execute mechanical-related portions of PEC for the equipment and systems to be commissioned.
 - d. Perform and clearly document completed startup and system operational checkout procedure. Providing (4) four copies of the results to the Owner.
 - e. Resolve any open punch list items before FPT. Air testing and balance shall be completed with discrepancies and problems remedied before FPT of respective air -related systems.

- f. Provide skilled technicians to execute starting of equipment and to execute PFT. Ensure that technicians are available and present during agreed upon schedules and for sufficient duration to complete necessary tests, adjustments, and solutions to identified problems.
- g. Maintain a log of events and issues of tests and all related Cx activities. Submit handwritten reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests, and lists of completed tests as specified.
- h. Correct open issues and re-test as needed to prove compliance with system operational standards.
- i. Prepare Operation & Maintenance Manuals and provide training for the District maintenance personnel and end-users per Section 01820.
- j. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of Warranty and notify the Owner.
- k. Execute simulated seasonal FPT, witnessed by the Owner and the CxA, as specified. Document all results and perform corrections as needed for system acceptance and make necessary adjustments to Maintenance & Operations Manuals and Record Drawings.

3.04 SENSOR CALIBRATION

- A. Field-installed temperature, relative humidity, CO₂, pressure sensors, pressure gages, and actuators (dampers and valves) shall be calibrated using the methods described below. Calibration procedures shall be documented during execution of the Start-up and the PEC. Alternate methods may be used, if approved by the CxA.
- B. Test instruments shall have had a NIST certified calibration within the last 12 months. Sensors installed in the unit at the factory with provided calibration certification need not be field calibrated.
- C. Sensors:
 - 1. Verify that sensor locations are appropriate and away from causes of erratic operation.
 - 2. Verify that sensors with shielded cable are grounded only at one end.

3. For sensor pairs that determine a temperature difference, make sure they are reading within 0.2°F of each other.
4. For sensor pairs that determine a pressure difference, make sure they are reading within 2% of each other.
5. Calibration: Put the equipment in operation. Make a reading with a calibrated test instrument within six inches of the site sensor. Verify that the sensor reading (via the permanent thermostat or gage) is within the tolerance listed in the table below of the instrument-measured value. If not, calibrate or replace sensor.
6. Tolerances:

<u>Sensor</u>	<u>Required Tolerance (+/-)</u>
AHU wet bulb or dew point	2.0°F
Outside air, space air, duct air temps	0.4°F
Watt-hour, voltage & amperage	1% of design
Pressures, air, water and gas	3% of sensor range (inc. design value)
Flow rates, air	10% of sensor range (inc. design value)
Flow rates, natural gas	5% of sensor range (inc. design value)
Relative humidity	4%
CO ₂ monitor	100 ppm
Sound level	5 db - Type 1 meter (Per Calibrator Mfg.)
Domestic Hot Water Temperature	1.5 °F
Domestic Hot Water Pressures Water & Gas	3% of sensor range (inc. design value)
Flow Rates, Domestic Water	4% of sensor range (inc. design value)

3.05 ADJUSTING

- A. Systems improperly adjusted; incorrectly installed equipment and/or deficient Contractor's performance may result in additional work being required for commissioning acceptance.
 - 1. Contractor shall perform all work required to correct installations not meeting contract requirements at no additional cost to the Owner.
- B. Corrective work shall be completed in a timely manner to permit completion of the Cx process.
- C. If systems' Cx deadline, as defined in the Project Schedule, goes beyond the scheduled completion without resolution of the problem(s), the Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem.

3.06 TRAINING

- A. Provide training as required in applicable Division 15 specification sections and section 01820.

END OF SECTION

PART 1 GENERAL

1.0 RELATED SECTIONS

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents. Consult the above for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.

1.01 CONTROL SYSTEM DESCRIPTIONS

- A. The Building Automation System (BAS) shall be as indicated on the drawings and described in these specifications. System shall include a network of commercial Internet-programmable thermostats, their accessories, and any other networked devices required for complete climate management. Devices shall communicate across a wireless network using IEEE 802.15.4 technical standards. Wireless communication shall be of an automated mesh communication type, which self-establishes network addresses, communication routes, and all other setup requirements to establish connection across the entire campus. A single Ethernet-connected Gateway shall be able to connect the wireless mesh network to the Internet, allowing for climate management through a cloud based web-application. This network design is to be used to isolate the BAS from the owner's private Ethernet network (LAN) and/or WiFi networks. IEEE 802.11 or any other wireless standard of communication or a wired network communication protocol between devices is not acceptable by these BAS specifications. The Gateway is to connect to a single outbound Ethernet connection on the owner's wide area network (WAN) over a TCP/IP connection. The owner's firewall shall not require any inbound port assignments for the Gateway to connect to the cloud servers. The Gateway shall not require a Public IP and it shall not run any standard available operating systems, such as Windows or Linux.
- B. Access and control of BAS shall be through a web-based graphical management platform. The BAS platform shall sit on a cloud server and be accessible on both local personal computers and remotely by use of a web-browser that supports HTML5 or later.
- C. No on-site servers are to be installed or used for the BAS. No licensing fees or future licensing fees shall be required as part of the BAS. These specifications and guidelines are to create a cohesive and secure network that provides full management over the facility's climate through the cloud BAS.

- D. The BAS shall accommodate an unlimited simultaneous multiple-user operation. Access to the BAS shall be limiting based on security permissions of each operator's role managed by owner site Administrators.

1.02 APPROVED BUILDING AUTOMATION SYSTEM MANUFACTURERS

- A. Pelican Wireless Systems

1.03 SUBMITTALS

- A. Shop drawings and manufacturer's standard specification data sheets on all hardware shall be provided for this project. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications.
- B. All submittals shall be bound, in a three-ring binder, or provided digitally on a USB stick with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect or Engineer for distribution and review.
- C. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring (installed by others) to be controlled by system and locations of thermostats, gateways, and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by others, required for proper installation of systems of this section.
- D. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.
- E. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

1.04 SYSTEM STARTUP & COMMISSIONING

- A. Each BAS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Documentation shall be provided to the owner that proves installation and testing has been completed and points out any mechanical issues found which are not related to the installation of the BAS. Successful completion of the system tests shall constitute the beginning of the warranty period.
- B. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor

shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to the BAS.

C. Upon completion of installation, submit three (3) copies of record documents. The documents shall be submitted for approval prior to final completion and include:

1. Testing and Commissioning Reports and Checklists signed off by trained field commissioning personnel.
2. Name, address and telephone number of Contractor personnel managing and installing equipment, along with service personnel responsible for supporting the ongoing warranty and services of the control system.
3. Procedures for operating the BAS, including logging on/off, alarm management, reading reports, trends, modification of setpoints, scheduling, and other interactive system requirements.
4. Provide information on how to receive support from Pelican Wireless Systems and communicate that they are a direct supporting resource. Contact information for Technical Support from Pelican Wireless Systems is to be provided.

1.05 CODES AND STANDARDS

A. Codes and Standards. Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section:

1. California 2016 Title 24 Compliant
2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified
3. OpenADR 2.0 certified

1.06 TRAINING

A. The BAS Contractor shall provide training for two (2) owner representatives and/or maintenance personnel. The BAS Contractor shall provide on-site training to the District's representative(s) and maintenance personnel per the following description:

- B. On-site training shall consist of a minimum of (1) hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include:

1. System Overview
2. System Application and Operation
3. System Access
4. Application Features Overview
5. Changing Set Points and other attributes
6. Scheduling
7. Editing configurable variables
8. Graphics
9. Viewing Historical Reports
10. Operational sequences including start-up, shutdown, adjusting and balancing
11. Equipment maintenance

1.07 OPERATING AND MAINTENANCE MANUALS

- A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire BAS.
- B. Following project completion and testing, the BAS contractor will submit as-built documentation reflecting the exact installation of the system.

1.08 WARRANTY

- A. The BAS contractor shall warrant the system for 12 months after system acceptance and beneficial use by the owner. During the warranty period, the BAS contractor shall be responsible for all necessary revisions as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. BAS equipment shall include a limited-warranty by the manufacturer for a period of five (5) years from the time of system acceptance.
- B. Limited-warranty by manufacturer is limited to replacement of defective products.

1.09 WORK BY OTHERS

- A. The BAS Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work prior to fabrication and installation. The owner's representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. BAS Contractor shall provide field supervision to the Mechanical Contractor for pre-installation of control components.
- B. Low-voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by others. Unless otherwise noted all new low-voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacturer's Installation Instructions) installed per owner's specifications. (Wiring in existing installations shall be minimum three (3) conductor/18-gauge wires per BAS manufacturer's standard specifications, multiple conductor/18-gauge thermostat wiring preferred - see Installation Instructions for specific conductor counts depending on heating and cooling modes of existing equipment.)
- C. Related work provided by others:
 - 1. 110V outlets shall be provided within five (5) feet of each Gateway or Wireless Repeater location.
 - 2. One (1) Ethernet data port shall be provided within ten (10) feet of each Gateway location.
- D. Equipment start-up and servicing.

1.11 SCOPE OF WORK

- A. Except where otherwise noted, the system shall consist of a network of commercial Internet-programmable thermostats, their accessories, and any other networked climate management device(s) required to fill the intent of the specification, sequence of operations, and provide for a complete and operable system.
- B. The BAS contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to bidding and submittal of a bid/price and notify the owner immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.
- C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this BAS contractor.

- D. When the BAS is fully installed and operational, the BAS contractor will make themselves available to meet with the designated representatives of the owner to review the as-installed condition of the system. At that time, the BAS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.
- E. The BAS contractor shall furnish and install a complete BAS control system, including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification.
- F. Provide and install BAS controls for the HVAC Equipment as noted on the drawings.
- G. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor, and the owner's team.
- H. Shall provide one training session in the operation of the system for owner's personnel.
- I. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction.

PART 2 PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

- A. Unless otherwise noted, all product shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems.

2.01 COMMUNICATION

- A. This project shall be comprised of a network of devices that use an IEEE 802.15.4 self-creating and self-healing wireless mesh communication network to reach an Ethernet Gateway.
- B. The Gateway shall communicate to cloud servers via a single Ethernet connection at the owner's wide area network (WAN) over a TCP/IP connection. The facility's firewall shall not require any inbound port assignments for the Gateway to connect to the cloud servers. The Gateway shall not require a Public IP.
- C. No BACnet, modBus, LON, or any other device-to-device wired communication protocol shall be used in the communication network.

2.02 OPERATOR INTERFACE

- A. The BAS shall be controlled, managed, and configured using a Web-App on any personal computer, smartphone, and/or tablet that runs a browser with HTML5 or newer.
- B. The Web-App platform shall run on cloud servers which allow for virtual access. Platform shall not run on a local on-site server.
- C. The Web-App shall support at a minimum, the following functions:
 - 1. Personal user log-on identifications (email addresses) and unique passwords shall be required.
 - 2. Custom HTML programming shall not be required to display any graphics, data, or build the Web-App. There shall be no development cost, commissioning costs, or software upgrade cost required to obtain and use the Web-App.
 - 3. Storage of historical data shall reside on the cloud server and shall not sit within the client's computer, internal network, or other devices. A BAS, which requires on-site data storage, is not acceptable.
 - 4. System shall allow for administrator and user defined access privileges.
 - 5. A Push/Pull OpenAPI interface with XML data output shall be available.
 - 6. Servers shall not run a Windows operating system.
- D. Control and Override
 - 1. The BAS shall provide view, override, and edit of the status of any object and property in the system. The status of the device shall be defined graphically and shall not require any custom programs or programming.
 - 2. Temporary Overrides. The BAS shall be able to provide temporary override (wherever an override is allowed) and automatically remove the override after a specified period of time.
 - 3. Any override and edit of a object virtually or at the device, if allowable, shall be historically tracked.
- E. Scheduling
 - 1. The BAS shall provide users with scheduling of application devices through a graphical interface. Scheduling shall include, but is not limited to:
 - i. Occupied/Unoccupied Schedules. Shall allow 12 scheduled set-time changes in a single day, be configurable for Daily, Weekly, and Weekday/Weekend layouts, and shall be able to be unique to

individual devices or easily shared between multiple devices, where applicable.

- ii. Event Schedules. Shall allow for advanced one-time or repeating event type schedules. Event schedules shall override Occupied/Unoccupied Schedules. After the Event schedule ends, the device shall revert back to the Occupied/Unoccupied Schedule automatically.
- iii. Vacation Schedules. A 360-day Calendar shall provide override of schedules during vacation days. Thermostats shall be able to automatically or be manually switched to follow Vacation Schedules instead of Occupied/Unoccupied Schedules.

F. Alarm Notification

- 1. Alarm Notification(s) shall be generated if there are failures detected by devices part of the BAS. These failures shall be, but are not limited to: temperature deviations, temperatures missing targets, temperatures too high or too low, failures of equipment, etc. Alarm Notification(s) shall be posted on the BAS and shall be able to be sent either via email or text message to an unlimited number of users.

G. Reports and Logs

- 1. Data shall be logged and stored on cloud servers for all devices part of BAS in real-time. Every device real-time "state change", when applicable, shall be stored and viewable for at least one week, with the option of up to two (2) years.
 - i. Each space temperature
 - ii. Each temperature set point(s)
 - iii. Each current call: heat, cool, number of stages, fan, economizer, etc.
 - iv. Each damper position
 - v. Each valve position
 - vi. Each CO² change
 - vii. Each CO² setting
 - viii. Each current call for ventilation due to high CO²
 - ix. Each Humidity change

- x. Each Humidity set point
 - xi. Each current call for dehumidification or humidification.
 - xii. Each Fan speed adjustment
 - xiii. Supply duct static pressure
 - xiv. Supply, Return, Outside air temperatures
2. Data shall be represented on historical graphs that allow for easy viewing of device state change at different times.
 3. Excel outputs shall not be required to view data. Historical data shall be viewable through BAS.

2.03 APPLICATION-SPECIFIC CONTROLLERS

- A. Application Specific Controllers shall not require custom programming and shall control specific equipment through simple configuration settings done through the cloud-based BAS. All configuration changes shall automatically upload into the device once set on the BAS and shall be stored by the device's internal memory.
- B. Gateways are devices which connected to an Ethernet port and act as a bridge between the BAS cloud servers and the wireless mesh network.
 1. Shall be capable of providing Internet connection to up to 2,000 devices.
 2. Shall be capable of automatically addressing routing tables to all devices part of wireless mesh network and shall not require manual programming or addressing.
 3. Shall communicate to cloud servers over a TCP/IP outbound-only connection.
 4. Shall not require a Public IP address, custom VPNs, or any on-site servers.
 5. Shall communicate to other BAS devices over the dedicated and isolated 802.15.4 IEEE technical standard.
 6. Shall be secured using AES (Advanced Encryption Standards).
- C. Internet-Enabled Thermostats are controllers which detect a space/zone temperature and operate equipment or dampers which supply heating, cooling, ventilation, or a combination of the three mechanical states, to their space/zone. Examples are thermostats for VAV, VVT, Fan-Powered Boxes, Fan Coil, Blower Coils, Unit Ventilators, Heat Pumps, Water Source Heat Pumps, and Conventional DX and/or Gas heat equipment.

1. Shall be capable of providing 24VAC outputs which can be configured to provide control of the following: two stages of fan, three stages of cooling, two stages of heating, one stage of auxiliary heat (heat pumps), floating point zone dampers, two position zone dampers, floating point zone reheat valves, and two position zone reheat valves.
2. Shall include a removable wiring terminal module that allows for thermostat installation even in situations where there are only three wires between equipment and where the thermostat is to be installed.
3. Shall be available with the following internal sensors: temperature only, temperature and humidity, temperature, humidity, and CO², and temperature and CO². All sensors required by the specifications are to be internal to the thermostat and not require two devices on the wall.
4. Shall be able to accept expansion accessories that allow for more advanced control sequences, and additional temperature detection. Examples are economizer controllers, outside air ventilation control, supply air temperature detection, unit ventilator face/bypass control, and modulating control. All expansion accessories shall be Internet enabled and accessible through EMS.
5. Shall communicate with the wireless mesh network through an internal wireless antenna that runs on the 802.15.4 technical standards.
6. Shall be able to automatically repeat the wireless mesh network to additional devices part of the BAS.
7. Shall automatically push, in real-time, to the BAS all "state changes" so as to be viewable historically and in real-time from BAS. Examples are changes in equipment operation (heat, cool, fan), number of stages active, the temperatures in the space, damper position, valve position, temperature set-points, etc.
8. Shall be able to lock-out heat pump compressor(s) based on outside air temperature.
9. Shall provide set-point (heat & cool) temperature limitations through BAS.
10. Shall provide full local keypad lock-out from BAS.
11. Shall meet California 2016 Title 24 code standards.
12. Shall have a programmable three (3°F) degree heat/cool temperature range which auto-adjusts to a five (5°F) degree dead band.
13. Shall have both a heat setpoint, cool setpoint, and auto-changeover.

14. Shall have Optimum Start algorithms that will calculate start times based on at least seven (7) days of previous run-time temperature and rate-of-change historical data for its space. Optimum Start algorithm shall recalculate each optimized schedule time before each optimized schedule.
 15. Shall be able to be manually overridden through BAS.
 16. Shall be configured through BAS.
- D. Wired Temperature Inputs are to be available to provide external temperature detection for specific BAS devices. Examples are to provide supply air temperature, water temperature, refrigeration temperature, outside air temperature, etc. to a thermostat or other device.
1. Shall accept 10K type II thermistors.
 2. Shall push to the BAS real-time temperature changes so as to be viewable historically and in real-time from the BAS.
 3. Shall accept a thermistor at a maximum of up to 100 feet from input terminal.
 4. Shall be configured through the BAS.
- E. Internet-Enabled Economizer Controller are controllers that modulate an outside air damper to provide ventilation and economization to a single zone.
1. Shall only require a dry-bulb outside air temperature sensor and dry-bulb supply air temperature sensor. No dry-bulb return air temperature sensor or dry-bulb mixing box temperature sensor shall be required to meet full economizer functionality to at a minimum California 2016 Title 24 standards.
 2. Shall communicate with thermostat to determine space temperature and space temperature setpoint in order to decide when economization can be used.
 3. Shall continue to economize as its only source of cooling as long as the outside air temperature is able to keep the space temperature within 1°F of the cool temperature setpoint.
 4. Shall be able to enable mechanical cooling at the same time as economization.
 5. Shall be able to prevent the supply air temperature from dropping below a minimum temperature.
 6. Shall provide enthalpy by use of pulling humidity and barometric pressure information from the Internet based on the zipcode of installation location.

Enthalpy shall not require any additional probes other than the dry-bulb probe and shall be free to enable.

7. If connected to a CO² thermostat, shall be able to provide demand ventilation control of outside air damper.
8. Shall have a minimum ventilation damper position and a maximum ventilation damper position.
9. Shall be able to be scheduled to not open the outside air damper for ventilation during unoccupied hours.
10. Shall be able to control a Variable Frequency Drive (VFD) with up to five (5) fan speed inputs. Example of fan speed changes are during ventilation, stage one cooling, stage two cooling, stage one heating, stage two heating.
11. Shall modulate an outside air damper by use of a 0-10VDC signal.
12. Shall accept a 0-10VDC signal feedback input from the outside air damper actuator to confirm outside air damper is working correctly.
13. Shall meet all California 2016 Title 24 codes, including Fault Detection and Diagnostic requirements.
14. Shall send Fault Detection and Diagnostic information to the BAS.
15. Shall accept a minimum of three (3) 10K type II thermistors.
16. Shall be able to modulate a 0-10VDC hot water, steam, or electric SCR for heating and outside air tempering.
17. Shall be able to modulate a 0-10VDC chilled water or modulating DX for cooling and outside air tempering.
18. Shall be able to control a face/bypass damper.
19. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from BAS. Examples are changes in equipment operation (heat, cool, fan, economization, ventilation), number of stages active, the supply air temperature, the return air temperature, hot water valve position, face/bypass damper position, variable speed fan setting, etc.
20. Shall be able to be manually overridden through the BAS.
21. Shall be configured through the BAS.

F. Internet-Enabled Power Relay Module are controllers which have dry-contact relays able to start/stop different electrical equipment. Examples are exhaust fans, lights, pumps, valves, boilers, chillers, etc.

1. Shall have relays with a max rating of 120 VAC @ 15 AMPs or 240/277 VAC @ 10 AMPs.
2. Shall have a low-voltage terminal for momentary contact override inputs. Override time shall be configurable for a specific amount of minutes through a configuration from the BAS.
3. Shall be able to provide Lead/Lag sequencing between relays.
4. Shall be able to accept an external dry-contact input used to verify flow if being used as a pump controller. If being used as a lead/lag pump controller, shall be able to alarm the BAS if flow is not detected when Pump A is enabled and start Pump B as a stand-by pump.
5. Shall communicate with the wireless mesh network through an external wireless antenna that runs on the 802.15.4 technical standards. Antenna shall be able to communicate with Power Relay Module over three (3) 18-gauge wires up to 500 feet between device terminal inputs.
6. Shall be able to automatically repeat the wireless mesh network to additional devices part of the BAS.
7. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are changes in relay positions On or Off.
8. Shall be able to be manually overridden through the BAS.
9. Shall be configured through the BAS.

G. Zone Controllers are controllers which operate equipment which supply heating, cooling and ventilation, or a combination of these mechanical states to multiple zones.

1. Shall communicate with the wireless mesh network through a removable wireless antenna that runs on the 802.15.4 technical standards.
2. Remote mountable antenna shall be able to communicate to Zone Controller over three (3) 18-gauge wires up to 500 feet between devices terminal inputs.
3. Communication from the Zone Controller to all zone/space Thermostats shall be over the wireless mesh network.

4. Shall be capable of providing 24VAC outputs which can be configured to provide control of the following: multiple stages of fan, multiple stages of cooling, and multiple stages of heating.
 5. Shall be capable of providing 0-10VDC outputs which can be configured to provide control of the following: variable speed fan (VFD), modulating outside air damper, modulating heating valve.
 6. Shall have integrated outside air damper control logic and not require a third-party or additional controllers to provide economization and ventilation control.
 7. Shall directly accept a supply duct static pressure probe. Shall have an integrated short-term and long-term learning PID loop algorithm for maintaining target supply static configurations. PID loop shall not require any type of cost for programming and is to be factory loaded into controller.
 8. Shall only require dry-bulb outside, return, and supply air temperature sensors.
 9. If communicating to CO² thermostat(s), shall be able to provide demand ventilation control of outside air damper.
 10. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are changes in equipment operation (heat, cool, fan, economization, ventilation), number of stages active, the supply air temperature, the return air temperature, the outside air temperature, hot water valve position, supply duct static reading, variable speed fan setting, etc.
 11. Shall be able to be manually overridden through the BAS.
 12. Shall be configured through the BAS.
- H. Make-up Air Controllers which operate equipment supplying ventilation to the building.
1. Shall communicate with the wireless mesh network through a removable wireless antenna that runs on the 802.15.4 technical standards.
 2. Remote mountable antenna shall be able to communicate to Controller over three (3) 18-gauge wires up to 500 feet between devices terminal inputs.
 3. Communication from the Controller to zone/space Thermostat(s) shall be over the wireless mesh network.

4. Shall be capable of providing 24VAC outputs which can be configured to provide control of the following: multiple stages of fan, multiple stages of cooling, and multiple stages of heating.
5. Shall be capable of providing 0-10VDC outputs which can be configured to provide control of the following: modulating variable speed fan (VFD), modulating outside air damper, modulating heating, modulating cooling.
6. Shall be able to modulate a VFD to maintain a targeted building static pressure.
7. Shall be able to modulate a 0-10VDC hot water, steam, or electric SCR for heating and outside air tempering.
8. Shall be able to modulate a 0-10VDC chilled water or modulating DX for cooling and outside air tempering.
9. Shall have integrated outside air damper control logic.
10. Shall directly accept a building pressure probe. Shall have an integrated short-term and long-term learning PID loop algorithm for maintaining target building pressure. PID loop shall not require any type of cost for programming, is to be factory loaded into controller, and updatable virtually through EMS.
11. Shall only require dry-bulb outside and supply air temperature sensors.
12. If communicating to CO² thermostat(s), shall be able to provide demand ventilation control of outside air damper.
13. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are changes in equipment operation (heat, cool, fan, economization, ventilation), number of stages active, the supply air temperature, the return air temperature, the outside air temperature, hot water valve position, supply duct static reading, variable speed fan setting, etc.
14. Shall be scheduled On or Off through the BAS.
15. Shall be able to be manually overridden through the BAS.
16. Shall be configured through the BAS.
- I. Wireless Proximity Sensors are thermostat accessories which are able to detect when a door or window is opened or closed, or be able to accept a dry-contact input from an occupancy sensor.
 1. Shall be able to communicate to a single Internet-Programmable Thermostat over wireless mesh network.

2. Shall communicate with the wireless mesh network through an internal wireless antenna that runs on the 802.15.4 technical standards.
 3. Shall run on two AA batteries and not require any unique type of battery to operate.
 4. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are if the door is open, if the space is unoccupied, if a window is open.
 5. Shall be configured through the BAS.
- J. Remote Wireless Sensors are thermostat accessories which are used to either average temperatures between the sensors location and a master thermostat or to relocate the sensing location of the master thermostat without having to run new wire.
1. Shall be able to communicate to a single Internet-Programmable Thermostat over wireless mesh network.
 2. Shall communicate with the wireless mesh network through an internal wireless antenna that runs on the 802.15.4 technical standards.
 3. Shall run on two AA batteries and not require any unique type of battery to operate.
 4. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are changes in equipment operation (heat, cool, fan), number of stages active, the temperatures in the space, temperature set-points, etc.
 5. Shall be configured through the BAS.
- K. Wireless Repeaters are devices which extend the 802.15.4 wireless mesh network across large expanses or where BAS devices are unable to repeat the wireless mesh network on their own. Examples are when bridging the wireless mesh network from one building to another.
1. Shall communicate with the wireless mesh network through an internal wireless antenna that runs on the 802.15.4 technical standards.
 2. Shall be able to automatically repeat the wireless mesh network to additional devices part of the BAS.
 3. Shall not require an Ethernet connection or any TCP/IP connection.
 4. Shall only require a single 120V outlet for power.

L. Configuration of Devices and System

1. To meet the sequence of operation for each controller, the controller shall be configured through the BAS by the installing contractor. No custom programming or downloading by use of a service tool shall be required.
2. Stand-Alone Operation: Each piece of equipment specified shall provide stand-alone operation. BAS devices shall not require web connection or communication to the BAS to run under normal operations.

PART 3 EXECUTION

3.0 EXAMINATION

- A. The Contract Documents shall be thoroughly examined for coordination of control devices, their installation, wiring, and commissioning. Coordinate and review mechanical equipment specifications, locations, and identify any discrepancies, conflicts, or omissions that shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- B. The BAS manufacturer shall be available to provide assistance to BAS Contractor in order to verify that control equipment can be installed as required, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.01 PROTECTION

- A. The BAS installing contractor shall protect all work and material from damage by their work or personnel, and shall be liable for all damage thus caused.
- B. The BAS installing contractor shall be responsible for their work and equipment until final inspection, testing, and acceptance. The BAS installing contractor shall protect their work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.
- C. Installation of BAS shall be performed by an approved Contractor. Approved contractor is one whom either has installed the BAS before or has been approved by the BAS manufacturer. The Contractor shall certify all work as proper and complete. Under no circumstance shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor unless that subcontractor meets the BAS approved Contractor requirements as stated above.
- D. Demolition. Remove controls which do not remain as part of the BAS. The owner will inform the Contractor of any equipment which is to be removed that will remain the property of the owner. All other equipment which is remove will be disposed of by the Contractor.

- E. Access to Site. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the owner or an owner-approved representative.
- F. Code Compliance. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.
- G. Clean Up. During installation, contractor shall maintain a clean environment. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

3.02 TEST AND BALANCE

- A. Testing of controls shall be performed by installing contractor. All equipment and their components being controlled shall be tested, including, but not limited too: heating enables and a proper supply air temperature from the AHU, RTU, and into the zone (if there is a zone box) is recorded, cooling enables and a proper supply air temperature from the AHU, RTU, and into the zone (if there is a zone box) is recorded, fan enables and the proper fan speed is set when specified (when using a multiple speed fan, VFD, or ECM motor), and that the outside air damper fully opens and closes when commanded. Any devices that are enabled and disabled shall properly respond to the BAS control signals.
- B. All control configurations shall be set to meet specifications. All temperatures and other sensors shall be determined accurate and configured for the type of temperature being detected.
- C. All mechanical systems controlled by BAS shall be properly balanced to the right CFMs to meet required codes and specifications.

3.03 WIRING, CONDUIT, AND CABLE

- D. All control wires between mechanical equipment and BAS devices are to be furnished and installed by others, unless BAS contractor is responsible for this part of the installation. The BAS contractor shall not begin work on this contract until all wiring is installed to the satisfaction of the BAS contractor.
- E. It is not an excuse to have not referenced the manufacturer's installation documentation or to have contacted the BAS manufacturer if wire installation is not understood and done incorrectly by the installing Contractor.

3.04 HARDWARE INSTALLATION

- A. Installation Practices for Devices. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.

B. It is not an excuse to have not referenced the manufacturer's installation documentation or to have contacted the BAS manufacturer if hardware installation not understood and done incorrectly by the installing Contractor.

C. Identification.

1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
2. All field enclosures, other than controllers, shall be identified with a nameplate. The lettering shall be in white against a black or blue background.
3. Junction box covers will be marked to indicate that they are a part of the BAS.
4. All field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
5. All field devices inside FIP's shall be labeled.

D. Existing Controls. Existing controls are not to be reused. All BAS devices will be new.

E. Control System Switch-Over. The installing contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on-site so that the entire switch-over can be accomplished in a reasonable time frame.

F. Location.

1. The location of sensors is as indicated in the mechanical and architectural drawings.
2. Space temperature, humidity, and CO² sensors will be mounted away from machinery generating heat, direct light, and/or diffuser air streams.
3. If external temperature sensors are installed, sensors will be mounted away from machinery generating heat, direct light, and/or diffuser air streams.
4. If outdoor air temperature sensors are installed, sensors are to be installed such that the effects of heat radiated from the building or sunlight is minimized.

3.05 SYSTEM CONFIGURATION

A. General. The installing contractor shall provide all labor necessary to install, initialize, start-up and troubleshoot all system hardware and configurations described in this section. This includes any requirements necessary to access the web application on third-party devices.

- B. Installing contractor shall work with owner's representative to determine configuration parameters including but not limited to hours of operation, set points, system variables, naming of devices, and site naming. Naming of devices and the site shall be performed by the installing contractor. Naming convention of space thermostats shall be space served. Naming convention of zone controllers shall be the equipment serial number. All naming shall be provided by or agreed upon with the owner.

3.06 SYSTEM COMMISSIONING AND SYSTEM STARTUP

- A. Each BAS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Documentation shall be provided to the owner that proves installation and testing has been completed and points out any mechanical issues found that are not related to the installation of the BAS. Successful completion of the system tests shall constitute the beginning of the warranty period.
- B. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to BAS.
- C. Upon completion of installation, submit three (3) copies of record documents. The documents shall be submitted for approval prior to final completion and include:
 - 1. Testing and Commissioning Reports and Checklists signed off by trained field commissioning personnel.
 - 2. Name, address and telephone number of Contractor personnel managing and installing equipment, along with service personnel responsible for supporting the ongoing warranty and services of the control system.
 - 3. Procedures for operating the BAS including logging on/off, alarm management, reading reports, trends, modification of setpoints, scheduling, and other interactive system requirements.
 - 4. Provide information on how to receive support from Pelican Wireless Systems and demonstrate that they are a direct supporting resource. Contact information for Technical Support from Pelican Wireless Systems is to be provided.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Provide ductwork and appurtenances required for a complete air transmission and distribution system for the heating, ventilating, and air conditioning systems indicated on Drawings and as specified.
- C. Related Sections:
 - 1. Section 09900: Paints and Coatings.
 - 2. Section 15010: Basic Mechanical Requirements.
 - 3. Section 15050: Basic Mechanical Materials and Methods.
 - 4. Section 15070: Mechanical Sound, Vibration and Seismic Control.
 - 5. Section 15080: Mechanical Insulation.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.
- B. Manufacturer's Data:
 - 1. Complete list of items to be furnished and installed under this section. Material lists that do not require performance data shall include manufacturer names, types and model numbers.
 - 2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.
 - 3. Literature shall include descriptions of equipment, types, models, sizes, capacity tables or curves marked to indicate performance characteristics, electrical requirements, options selected, space requirements (including allowances for servicing) and other data necessary to ensure compliance with requirements of these Specifications and performances indicated on Drawings. Data shall also include name and address of nearest service and maintenance organization that regularly stocks repair parts. Listings of items that

function as parts of an integrated system shall be furnished at one time.

4. Shop Drawings: Shop Drawings indicating methods of installation of equipment and materials, sizes and gages of ducts, and details of supports. Items to be covered shall include but not be limited to following:
 - a. Layout of ductwork and equipment drawn to scale to establish that equipment will fit into allotted spaces with clearance for installation and maintenance. Indicate proposed details for attachment, anchoring to, and hanging from structural framing of building. Indicate vibration isolation units, foundations, supports, and openings for passage of pipes and ducts
 - b. Drawings indicating locations and sizes of sleeves and prepared openings for pipes and ducts.
 - c. Typical details of supports for equipment and ductwork.

1.03 QUALITY ASSURANCE

- A. Installer's and Manufacturer's Qualifications: Comply with provisions stated under Section 15010: Basic Mechanical Requirements.

1.04 PRODUCT HANDLING

- A. Protection, Replacements, Delivery and Storage: Comply with provisions stated in Section 15010: Basic Mechanical Requirements.

1.05 COORDINATION

- A. Coordinate activities in accordance with provisions of Section 15010: Basic Mechanical Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Unless otherwise noted, provisions, including amendments thereto, of the HVAC Duct Construction Standards of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) and the California Mechanical Code (CMC), are hereby made part of this section.
- B. Rectangular, round and flat oval ducts shall be manufactured and installed in accordance with requirements of the HVAC Duct Construction Standards of SMACNA.

- C. Sheet metal ducts shall be fabricated from galvanized steel, aluminum or stainless steel.
- D. Galvanized steel ducts shall be fabricated of galvanized steel sheet, lock forming grade, conforming to ASTM A 525 and A 527.
- E. Galvanized steel ducts gage thickness and permissible joints and seams shall conform to requirements in Table 2, Minimum Metal Gages, of this section.
- F. Ducts shall be reinforced in accordance with SMACNA standards.
 - 1. Cross-broken Duct: Duct sizes 19 inches wide and larger which have more than 10 square feet of unbraced panel shall be beaded or cross-broken. This requirement is applicable to 20 gage or less thickness and 3 inches w.g. or less pressure. For details, refer to SMACNA manual.
- G. Round, Oval and Flexible Duct for Galvanized Steel:
 - 1. Round Spiral Ducts and Fittings: Fabricated from galvanized sheet steel shall be machine-formed spiral pipe with sealed spiral locking joints. Fittings shall be furnished with continuous corrosion-resistant welds. Ducts and fittings shall be as manufactured by United Sheet Metal, or equal. Provide gages of ducts and fittings recommended by manufacturer.
 - 2. Details of seams and transverse joints for round duct and fittings shall conform to SMACNA standards.
 - 3. Flat oval ducts shall be provided as indicated on the Drawings. Reference standard details in SMACNA manual.
 - 4. Minimum duct wall thickness for flat oval duct construction shall be as indicated in SMACNA manual.
 - 5. Non-metallic flexible duct for T-bar suspended ceiling may be provided upon review of the Architect, after submittal of installation, bench details and certified test data in accordance with the Air Diffusion Council Test Code FD-72. Flexible duct shall be rated for not less than 6 inches w.g. static pressure.
 - 6. Flexible duct shall be non-metallic, insulated for conditioned air supply and return. The flexible ducts shall be factory fabricated with exterior reinforced laminated vapor barrier, 1-1/2 inch thick fiber glass insulation ($K=0.25$ @ 75 degrees F.), encapsulated zinc-coated spring steel wire helix and impervious, smooth, non-perforated interior vinyl liner and factory fabricated steel connection collars. For the composite assembly, including insulation and vapor barrier,

comply with NFPA Standard 90 A or 90 B and tested in accordance with UL Standard, UL-181. Non-insulated metallic ducts shall be provided for exhaust only.

7. Methods of installations, standards for joining and attaching, and supporting flexible duct shall conform to applicable provisions of SMACNA manual.
 8. These provisions apply for ducts furnished for indoor comfort heating, ventilating and air conditioning service only.
 9. Specifications herein shall not supersede installation requirements by flexible duct manufacturer if those are more stringent.
- H. Fittings and Other Construction Details: Details of fittings such as elbows, turning vanes, branch take-off and connections, duct access doors, connections for grilles, registers and ceiling diffusers, flexible connector at fan, etc., shall conform to applicable provisions of this section or SMACNA manual.
- I. Duct Seam and Joint Sealant: Furnish duct seam and joint sealant or tape for metal ducts. Sealant for low-pressure ducts shall be 3M Company Miracle D17, or equal, for installation with a caulking gun. Provide tape joints with canvas with Borden Chemical Division Arabol adhesive, or equal. Provide sealing material for medium-pressure ducts as described in the SMACNA manual for those pressures.
- J. Restrictions:
1. Zinc-coated steel duct shall not be installed for ductwork transporting moisture-laden air. Aluminum shall not be installed for kitchen cooking equipment ductwork. Fume hood exhaust shall be stainless steel, non-metallic, or coated metal as required. Flexible duct may only be furnished where specifically indicated on Drawings. Aluminum ducts shall not be installed for internal pressures above 2 inches of water.
 2. Fiberglass duct is not permitted as a substitute for sheet metal duct.

2.03 ACOUSTICAL DUCT AND PLENUM LINERS

- A. Duct liners shall conform to requirements of Section 15080: Mechanical Insulation.

2.04 DAMPERS

- A. Manually Operated Volume Control Dampers:

1. VD-1, Rectangular: Multi-blade type, opposed blade operation, 16 gage galvanized steel blades; center pivoted on 3/8 inch diameter steel trunnions; interlocking edges; dampers shall be in own angle frame, full duct size as indicated on Drawings; frame of minimum 16 gage steel channel construction. Provide with damper operator and axles positively locked to blade. Ruskin MD 35, or equal.
 2. VD-2, Round: Frame shall be constructed of not less than 16 gage galvanized steel, blades of not less than 16 gage galvanized steel channel construction with factory neoprene seals, 1/2 inch diameter axle shafts and locking hand quadrant. Ruskin CDR S25, or equal.
 3. VD-3, Oval: Frame shall be constructed of not less than 14 gage galvanized steel channels with factory blade seals of not less than 12 gage galvanized steel with not less than 1/2 inch diameter axle shafts. Provide Ruskin standard construction for frame, blade and axle size, thickness and material variation. Provide adjustable locking hand quadrant. Ruskin CDO 25, or equal.
- B. Motorized Volume Control Dampers:
1. MVD-1, Rectangular: Multi-blade type opposed blade operation, 16-gage minimum steel channel frame construction; 16-gage galvanized steel blades center pivoted on 1/2 inch diameter steel trunnions. Interlocking edges. Dampers shall be in own angle frame. Full duct size as indicated on the Drawings. Provide with matching 2-position motorized actuator with linkages, 120 VAC by Barber-Colman, Honeywell, or equal. Ruskin, Damer CD35, or Pottorff.
 2. MVD-2, Round: Butterfly type constructed with minimum 18 gage galvanized steel frame with steel angle reinforcement on above 20 inches diameter. Blade 2-layer, minimum 14-gage equivalent thickness. Neoprene seal to ensure air tightness in closed position. Furnish with matching 2-position motorized actuator with linkage 120 VAC by Barber-Colman, Honeywell, or equal.
- C. Relief Dampers: Parallel multi-blade type. Constructed of 20 gage galvanized sheet steel or aluminum alloy with solid stops all around. Bearings shall be self-lubricated type. Damper shall open on a positive pressure within space and close to a backdraft. Interlocking edges shall prevent dust infiltration when closed. Air Balance, Pottorff, Ruskin or Metal Form.
- D. Duct Access Panels: Provide factory fabricated access panels in ducts where required for servicing fire or smoke dampers, and at other locations as specified in this section. Units shall consist of removable panel, gasketed and pressure sealed by controlled spring tension locks. Construct unit, including interior parts, of same material as duct. Units shall be constructed

to be suitable for installation in systems of up to 5 inches water gauge static pressure.

2.05 AIR DISTRIBUTION DEVICES

A. General:

1. Grilles, registers, diffusers and appurtenances shall conform to requirements specified herein and shall be of type and sizes as specified and indicated on Drawings. Performance shall be in accordance with Air Diffusion Council Test Code 1602R2 including airflow velocity, pressure, temperature, and sound measurements.
2. Sponge neoprene, rubber, vinyl or felt border gaskets shall be provided for surface-mounted registers, grilles or diffusers.
3. Maximum sound level for supply diffusers and return and exhaust grilles shall not exceed NC 35.
4. Ceiling diffusers shall be provided with equalizing deflectors. Barber-Colman Deflectrol, Anemostat Model ED, Tuttle, or Bailey M-6.
5. Ceiling mounted grilles, registers and diffusers shall be provided with a factory applied, baked enamel, dull finish, bone white to match acoustical ceiling tile.
6. Grilles or registers mounted on painted walls or other surfaces shall be furnished with a baked prime coat and finish painted in accordance with Section 09900: Paints and Coatings.
7. Ceiling diffusers return grilles with duct connections, and exhaust grilles shall be provided with loose key-operated opposed blade volume control. Volume controls for return grilles without duct connections are not required.

B. Ceiling Diffusers - Round, Square, Rectangular:

1. CD-1, Acoustical Tile on Plaster Ceilings or Exposed Ceilings: Units shall be square or rectangular modular core type flush and flanged for surface mounting. Anemostat Type RMD-S, or equal.
2. CD-2, Prefabricated Acoustical Tile Ceilings with Inverted Exposed T-Bars: Units shall be square or rectangular modular core lay-in, flush panel type with a nominal overall dimension of 24 inches x 24 inches. Anemostat Type RMD-FP, or equal.
3. CD-3: Units shall be round, adjustable pattern, surface-mounted type. Anemostat Type C-27, or equal.

C. Grilles - Return, Exhaust, Ceiling, Square, Rectangular:

1. GR-1, Acoustical Tile on Plaster Ceiling: Return and exhaust grilles shall be single deflection type with horizontal fixed face bars set at straight or 45 degree angle and flush and flanged for surface mounting. Anemostat Type S3HD, or equal.
2. GR-2, Prefabricated Acoustical Tile Ceiling with Inverted Exposed T-Bars: Return and exhaust grilles shall be with single deflection horizontal fixed face bars, set at straight or 45 degree angle flush, lay-in panel type with nominal overall dimension of 24 inches x 24 inches. Anemostat Type SAC3LD, or equal.

D. Registers, Supply, Return, Wall:

1. WR-1: Sidewall supply register shall be double deflecting type with loose key-operated opposed blade volume control. Anemostat Type S2HO, or equal.
2. WR-2: Sidewall return register shall be single deflecting type with horizontal fixed face bars set at 45 degree angle flush and flanged for surface mounting and complete with loose key-operated opposed blade volume control. Anemostat Type S3HOD, or equal.

2.06 SMOKE DETECTORS

- A. Refer to Division 16: Fire Alarm Systems

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 DUCTWORK

- A. Construct ductwork according to details of fabrication and methods of support, as indicated in the SMACNA manuals and CMC, unless specified or indicated otherwise in this section or on Drawings. In event of conflict, the most stringent requirement shall be provided.
- B. Unless otherwise required, construct ducts to conform accurately to dimensions indicated and to be straight and smooth on inside, with joints neatly finished.

- C. Duct dimensions indicated are net inside dimensions. If the indicated duct is to be furnished with an acoustic lining, add twice the thickness of the acoustic liner in both the duct width and height dimensions to provide the gross sheet metal duct dimensions.
- D. Where aluminum is welded, provide aluminum with thickness of minimum 16 gage, and metallic arc or acetylene process of welding.
- E. Anchor ducts to building structural slab, framing and roof decking and detail method of anchoring and fastening if not indicated on Drawings. Supports shall be seismically constructed.
- F. Construct and install ducts to be completely free from vibration under operating conditions.
- G. Indicate on layout drawing, required for suspended ductwork, location of supports, loads imposed on each fastening or anchor, typical details for anchorage, and details for special anchorage for supports attached to metal roof decking.
- H. Attach supports only to building structural framing members and concrete slabs.
- I. Where supports are required between structural framing members, detail and install suitable intermediate metal framing.
- J. Ducts transporting air-conditioned or heated supply air shall be insulated in accordance with requirements of Section 15080: Mechanical Insulation.
 - 1. Ducts exposed to weather shall be furnished with exterior insulation with weather jacket and interior lining as indicated on Table 2, Section 15080: Mechanical Insulation.
- K. Ferrous angles and structural members and joining collars specified for construction and support of ductwork and plenums shall be primed with one heavy coat of required asphaltic aluminum paint before installation or fabrication. Metal surfaces shall be thoroughly cleaned before installation of paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls are not required to be primed or painted.
- L. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.

3.03 DUCT CONSTRUCTION

- A. Minimum ductwork gages, joints, reinforcing, and bracing shall conform to the following tables. Hoods, plenums, and castings shall not be lighter than

the duct gage listed in Table 2 for corresponding dimensions. Additional bracing shall be provided to prevent objectionable panel vibration.

- B. Provide longitudinal seams of the grooved snap lock and standing, sealed and taped, or sealed spiral or continuously welded. For exhaust duct, taping may be omitted.

TABLE 1 - SHEET METAL THICKNESS FOR CIRCULAR DUCTS AND FLAT-OVAL

(FOR STATIC PRESSURES LISTED)

Joints	Gage Thickness		Diameter of Duct		Horizontal Girth	
	2" Water Column					
	Maximum S.P.		Maximum		Maximum	
	Round / Oval		Diameter Support		Distance	
	26 / 24	Up to 9"	10'	2"slip		
	26 / 24	9" - 14"	8'	4"		
	24 / 22	14" - 23"	8'	4"		
	22 / 20	23" - 37"	8'	4"		
	20 / 18	37" - 51"	6'	1¼" x 1⅛" flange		

- C. Construction Details for Rectangular Sheet Metal Ducts for Low-Pressure Systems - Velocities not Exceeding 2,000 Feet Per Minute:

- For pressures in excess of 2 inches water column, duct wall thickness shall be 2 gages heavier than set forth in this table.
- Duct specifications shown below are applicable when ducts larger than 18 inches are cross-broken. Where cross breaking is not provided, duct wall thickness shall be 2 gages heavier on ducts 19 inches to 60 inches wide unless longitudinal standing seams are furnished.

TABLE 2 - MINIMUM METAL GAGES

Minimum Gage	Max. Side,	Duct Permissible Girth	Horizontal
Thickness	Gross	Joints & Longitudinal	Support
			Maximum

Steel / Aluminum	Dimensions	Seams	Distance
26 / 24	Up to 12"	Drive-slip, plain S-slip, or 1" pocket lock	10'
24 / 22	13" - 18"	Drive-slip, plain S-slip, 1" pocket lock	10'
Minimum Gage	Max. Side,	Duct Permissible Girth	Horizontal Support
Thickness	Gross	Joints & Longitudinal	Maximum
Steel / Aluminum	Dimensions	Seams	Distance
24 / 22	19" - 30"	Hemmed S-slip, 1" bar slip, or 1" pocket lock on 5' centers. Hemmed S-slip, 1" slip, or 1" pocket lock on 5' centers with 1" x 1" x 1/8" angles on center line between. Hemmed S-slip, 1" bar slip, or 1" pocket lock on 10' centers with cross break 1" standing seam on 5' centers.	10'
22 / 20	31" - 42"	1" bar slip, reinforced bar slip, or pocket lock 5' centers. 1" bar slip, reinforced bar slip, or pocket lock on 10' centers with 1" x 1" x 1/8" angles on center line between.	8'

1" standing seam on 5' centers
inside longitudinal standing seams
with 1"x 1" x 1/8" angles on 5'
centers on exterior.

22 / 20	43" - 54"	1-1/2" bar slip, reinforced bar slip, 8' or pocket lock on 4' centers. 1-1/2" bar slip, reinforced bar slip, 8' or pocket lock on 8' centers with 1-1/2" x 1-1/2" x 1/8" angles on center line between. 1-1/2" bar slip, reinforced bar slip, or pocket lock on 4' centers with cross break.
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Minimum Gage	Max. Side,	Duct Permissible Girth	Horizontal Support
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Thickness Maximum	Gross	Joints & Longitudinal
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<u>Steel / Aluminum</u>	<u>Dimensions</u>	<u>Seams</u>	<u>Distance</u>
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20*/ 18 8'	55" - 60"	1-1/2" standing seam on 3' centers inside longitudinal standing seam with 1-1/2" x 1-1/2" x 1/8" angles on 4" centers on exterior.
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20*/ 18	61" - 84"	Reinforced bar slip, angle slip, 6' alternate bar slip, or angle reinforced pocket lock on 4' centers using 1-1/2" x 1-1/2"
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1/8" 1-1/2" x 1/8" angles on
centerline between reinforced
bar slip, angle slip, alternate
bar slip or angle reinforced
pocket lock on 8' centers using
1-1/2" x 1-1/2" x 1/8" reinforcing
angles 2' on centers in-between 1-1/2"
angle reinforced standing seam on
2' center using 1-1/2" x 1-1/2" x
1/8" reinforcing angles. Inside
longitudinal standing seams with
1-1/2" x 1-1/2" 1/8" angles on
2' centers on exterior.

- * Button punch snap-lock seams, Lockformer, or equal, shall only be permitted on 20 and 22 gage galvanized steel ducts. For aluminum duct, button punch snap-lock is not permitted.
- D. Ferrous angles and structural members and joining collars specified for the construction and support of ductwork and plenums shall be primed with one heavy coat of asphalt aluminum paint before installation or fabrication. The metal surface shall be thoroughly cleaned before application of the paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls is not required to be primed or painted.
- E. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.
- F. S-type or drive-slip type girths or longitudinal seams shall not be furnished for ductwork installed outdoors or mounted on roofs. Provide angle-reinforced government lock only.
- G. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.

3.04 DUCTS AND PLENUMS WITH LINERS

- A. Ducts and plenums lined with acoustical insulation shall be as indicated on Drawings.
- B. Duct dimensions indicated on Drawings are net. Add thickness of acoustic liners to obtain gross sheet metal duct dimensions.
- C. For duct liner Specifications and installation, refer to Section 15080: Mechanical Insulation.

3.05 DUCT ELBOWS AND TURNING VANES

- A. Duct elbows, including supply, exhaust, and return, shall be provided with a centerline radius of 1.5 times duct width parallel to radius whenever possible; centerline radius shall not be less than width of duct parallel to radius.
- B. Where space does not permit above radius, or where square elbows are indicated on Drawings, turning vanes shall be installed whether indicated on Drawings or not.
- C. Turning vanes shall be thick double-wall vane type, Titus Y or Z, Tuttle and Bailey, or equal. Duro-Dyne vane rail system duct turns may be furnished, provided they are of thick double wall type and Shop Drawings are submitted and reviewed by the Architect. Duct turning vanes shall be of same material as ductwork and shall be rigidly fastened in ductwork.

3.06 DUCT JOINTS AND SEAMS

- A. Conditioned air supply ducts shall be furnished with joints and seams taped for air tightness or welded, except spiral seam factory machine formed duct components. Spiral seam is exempted. Joints between slip-fit components may be assembled with all seams and joint connections fastened with screws and taped.
- B. Other ducts shall be furnished with joints and seams sealed by caulking, taping, soldering, or welding. Ducts for grease hood exhaust shall be furnished with grease-tight welding or brazing on external surface for joints and seams. Fiberglass ducts shall be provided with a thermally activated closure system, Johns Manville Fortifiber Therm-Lock with Automatic Bond Indicator dots, or equal.
- C. S-slip or drive-slip type girths or longitudinal seams are not permitted on exterior or exposed rooftop mounted ductwork. Provide angle-reinforced government lock only.
- D. Caulking, taping, or other joint or seam treatment shall be provided in accordance with recognized standards.

- E. Unless otherwise detailed, taping shall be with Duro-Dyne FT-2, 2-inch wide tape, installed over S-2 duct sealer or Arabol and canvas tape or listed Miracle tape. Ducts shall not be covered or insulated on outside until joints are inspected by the PI. A second coat of Arabol or adhesive shall be installed 24 hours after initial application if separation occurs. Provide only approved and UL or Factory Mutual listed material for sealing and caulking.
- F. Seams around fan, coil housing and plenums shall be sealed with gaskets or caulking compound to provide an airtight assembly.
- G. Ductwork connected to range hoods shall be provided with grease-tight seams, and shall be constructed and installed so that grease or other material cannot become pocketed in any portion thereof, and system shall slope downward toward hood not less than 1/4 inch per lineal foot. Joint caulking or sealing compound shall be as required by DSA.
- H. Duro-Dyne S-2, or equal, as recommended and guaranteed by manufacturer for this specific application, shall be installed in accordance with manufacturer's recommendations. Metal surfaces shall be thoroughly cleaned before installing caulking compound. Galvanized surfaces shall be etched, if necessary, to obtain a bond between metal and caulking compound.

3.07 DUCT TRANSITION

- A. Slopes in sides of transition pieces shall be no greater than 1 to 5. Abrupt changes or offsets in duct system are not permitted, except when reviewed by the Architect.

3.08 DUCT TEST HOLES

- A. Holes in ducts and plenums shall be provided for pilot or static tubes for obtaining air measurements to balance or check air systems. Holes shall be covered with neoprene gasketed sheet metal cover or plugged with a fitted neoprene plug chained to duct.

3.09 SOUND ATTENUATING EQUIPMENT

- A. Install sound attenuators where required and indicated on Drawings. Refer to manufacturer's instructions for required installation.

3.10 FLEXIBLE CONNECTIONS

- A. At points where sheet metal connections are installed to fans or air handling units, or where ducts of dissimilar metals are connected, a flexible connection of commercial grade, Duralon by Duro-Dyne Corporation, or equal, non-combustible material shall be installed and securely fastened by zinc-coated steel clinch-type bands or a flange type connection. Inlet and outlet openings shall be axially in-line, maximum deviation of centerline

shall be less than 5 percent of diameter or shortest dimension of a rectangular inlet of fan or air handling unit, with system at rest. Duct end of connection shall be seismically restrained if more than 4 feet from last support.

3.11 AIR TERMINAL DEVICES

A. General:

1. Install supply devices after ducts, plenums, and casings have been cleaned and blown free of small particles, as specified. Devices shall be aligned to be parallel to ceiling construction or walls and ceiling surfaces and shall be pulled tightly to compress gaskets and to fit neatly against surfaces.

- #### B. Diffusers:
- Support surface mounted ceiling diffusers from angles or channels resting on and fastened to ceiling construction. Do not support from ducts. Install lay-in diffusers on T-bar ceilings supported by ceiling structure. Provide sheet metal adaptor box above each diffuser to allow space for volume controller with round collars for connection to round ducts where indicated on Drawings. Fasten duct-mounted diffusers to duct collars.

C. Registers and Grilles:

1. Install wall supply registers at least 6 inches below ceiling, unless otherwise indicated. Locate return and exhaust registers 6 inches below ceiling unless otherwise indicated.
2. Support ceiling diffuser type inlets, registers, and grilles as required above for ceiling diffusers.
3. Fasten wall mounted and duct mounted registers and grilles to flanges of duct collars.

3.12 DAMPERS

- #### A. Manually operated dampers, gravity dampers, fire dampers, and motor operated dampers shall be furnished and installed as specified and indicated. Upon completion of installation, dampers shall be checked, lubricated, and adjusted so that they operate freely, without binding. Dampers shall be of standard commercial manufacture, complete with damper frame. Where painting is required, they shall be shop finished unless otherwise noted.

1. Balancing dampers shall be installed in main supply ducts from fan discharge plenums, where 2 or more ducts are connected to each plenum, although such balancing dampers may not be indicated. Each zone shall be provided with a manual volume damper. Sheet

metal screws shall be installed through handles and into ducts to lock damper in place after test and balance.

2. Supply, return, and exhaust branches shall be provided with manual volume dampers.
3. Dampers installed in accessible locations shall be provided with locking and indicating quadrants. Ventlock, Duro-Dyne, or equal.
4. Dampers installed in ductwork in furred ceiling spaces or in roof spaces with less than 30 inches of clearance below beams, joists, or other construction, and where access panels are not provided shall be furnished with damper rods extended below ceiling and terminated with a concealed damper regulation. Ventlock, Young, or equal.
5. Dampers not identified as splitter, extractor, or butterfly dampers shall be of multi-louver type arranged for opposed blade operation. Damper shall be same dimension as adjoining duct and be tight closing. Blades shall be not greater than 4 inches. Dampers shall be not less than 20 gage steel. Teflon, or equal.
6. Motor operated dampers shall be furnished by temperature control manufacturer as part of temperature control equipment and shall conform to requirements of Section 15975: Direct Digital Control System.
7. Dampers shall be provided with accessible operating mechanisms. Where operators are exposed in finished portions of building, operators shall be chromium-plated with exposed edges rounded. Splitter dampers are not permitted unless specified and reviewed by the Architect.
8. Dampers shall not be installed in combustion air ducts.
9. Access panels shall be installed for access at each damper's operating mechanism.

3.13 BACKDRAFT DAMPERS

- A. Backdraft dampers shall be installed at locations indicated in accordance with the State of California Energy Conservation Standards, Title 24, CCR.

3.14 DUCT SLEEVES AND PREPARED OPENINGS

- A. Furnish duct sleeves for 15-inch diameter ducts or less passing through floors, walls, ceilings, or roof and install during construction of the floor, wall, ceiling, or roof. Install round ducts larger than 15 inches diameter and square and rectangular ducts passing through floors, walls, ceilings or roof

through prepared openings. Provide duct sleeves and prepared openings for duct mains and duct branches.

- B. Provide one inch clearance between duct and sleeve or between insulation and sleeves for insulated ducts, except at grilles, registers and diffusers.
- C. Provide prepared openings for round ducts larger than 15 inches in diameter and for square and rectangular ducts with one inch clearance between duct and openings or between insulation and opening for insulated ducts, except at grilles, registers and diffusers.
- D. Provide closure collar of galvanized sheet metal not less than 4 inches wide unless otherwise indicated on Drawings on each side of walls or floors where sleeves or prepared openings are provided except where grilles or diffusers are installed. Install collar tight against surface. Fit sharp edges of collar installed around insulated duct to preclude tearing or puncturing insulation covering vapor barrier. Fabricate collars from round ducts in steel. Provide not less than 4 nails to attach collar where openings are 12 inches in diameter or less and not less than 8 nails where openings are 20 inches in diameter or less.
- E. Pack space between sleeve or opening and duct or duct insulation with commercial grade packing yarn.

3.15 FLEXIBLE DUCT RUNOUTS

- A. Runouts from branches, risers or mains to air terminal units and outlets may be pre-insulated, factory fabricated flexible ducts complying with NFPA No. 90A. Flexible ductwork shall not exceed 7 feet in length. When required to suspend flexible ducts, furnish hangers of type recommended by manufacturers of pre-insulated flexible duct and install at intervals recommended. Method of attachment to other components of air distribution system for a vapor-tight joint shall be in accordance with printed instructions of flexible duct manufacturer. Bend radius shall be 1-1/2 times diameter of duct, measured from centerline. Bends greater than 90-degree angle are not permitted. Non-metallic flexible duct shall be permitted only in T-bar suspended ceilings.

3.16 DUCT HANGERS AND SUPPORTS

- A. Single horizontal ducts shall be suspended from heavy steel hanger straps securely fastened to overhead structural members. Ducts shall be supported by a hanger strap passing around and fastened to duct with not less than 2 Parker No. 10 screws set approximately 2 inches in from each edge, to form a supporting stirrup attached to overhead supports. Rectangular ducts shall be provided with 2 hanger straps, one located on each side of duct. Round ducts may be installed from a single hanger strap

unless conditions require that duct be held tight against ceiling, in which case 2 hanger straps may be brought down each side of duct, oriented at right angles to axis of duct and securely fastened to duct standing leg seam or angle iron stiffener with a minimum of 2 bolts, measuring 1/4 inch, for each side of duct. Hanger straps shall be galvanized with a minimum size of 1-1/8 inches x 14 gage. Angles of galvanized steel of 1-1/8 inches x 1-1/8 inches x 16 gage (14 gage for ducts 60 inches or greater) may be furnished instead of straps.

- B. Where ducts are installed one above the other, they shall be individually supported on a trapeze of steel angles with 3/8 inch supporting steel rods securely fastened to overhead construction. A minimum distance of 3 inches shall be maintained between ducts wherever possible, but in no event shall distance be less than 2 inches. Minimum sizes of steel angles shall be 1-1/2 inches x 1-1/2 inches x 1/8 inch for duct sizes through 60 inches in greatest dimension, 2 inches x 2 inches x 1/8 inch for duct sizes 61 inches through 84 inches, 2 inches x 2 inches x 3/16 inch for duct sizes 85 inches through 96 inches, and 2 inches x 2 inches x 1/4 inch for duct sizes over 97 inches
- C. Ducts 30 inches square area and greater and ducts 20 feet long and longer shall be seismically restrained. Refer to Section 15070: Mechanical Sound, Vibration and Seismic Control.
- D. Hangers shall not be supported by, or fastened to, non-structural members including blocking. Toggle or Molly type bolts are not permitted.
- E. Vertical ducts shall be supported with suitable angles on each side of each duct located at each floor and at intervals not to exceed 8 feet. Angles shall be sized for required span so that they will be rigid, without bending or sagging.
- F. Roof-mounted ductwork shall be installed a minimum 12 inches above roof and shall be supported by galvanized welded pipe, one on each side, and fastened to roof in pitch pan filled cold process cement. Install supports at each turn, unit connections, and each penetration, and space at maximum 6 feet off-center in general.

3.17 ACCESS PLATES AND DOORS

- A. Access plates and doors shall be furnished and installed where stops, valves, fire dampers, fusible links, coils, damper operating mechanism, control equipment, lubrication fittings, air filters, air handling equipment and similar items normally requiring adjustment or servicing are installed in concealed spaces.
- B. Access plates and doors shall be located to permit convenient access to equipment sized to permit removal of equipment for servicing. Access

plates shall be no less than 12 inches x 12 inches in clear opening. Proper servicing of equipment requires adequate access for maintenance personnel. Access doors shall not be less than 24 inches x 24 inches, unless otherwise detailed. Two or more valves shall not be located in same access area unless sufficient clearance is provided for operation, servicing and removal of each valve.

- C. Openings in ducts or plenums whose longer dimension does not exceed 12 inches may be covered by a plate of same material as duct, gasketed and fastened to duct or plenum with sheet metal screws.
- D. Access plates in floors shall not be less than 8 inches x 8 inches and shall be carborundum surface brass with cast brass frames anchored into concrete. Access plates in tile walls shall be chromium plated brass and polished. Approved serrated plates furnished as part of a clean-out assembly are permitted in floors instead of a separate plate.
- E. Access plates and doors in walls and ceilings of finished rooms and in locations normally accessible to students shall be furnished with continuous piano hinges, unless otherwise specified, and a special flush type spring-loaded latch requiring an Allen wrench to operate. Access devices shall be installed after plastering in plaster ground openings.
- F. Access panels or doors penetrating one-hour fire resistive ceilings shall meet code requirements for such openings.
- G. Access panels shall be fire rated Milcor manufactured by Inland Steel Products Co., or equal. Access doors shall be as required for installation in openings penetrating one-hour fire resistive ceilings. Access doors shall be furnished with a flush, key-operated cylinder lock, furnished with 2 keys each, instead of Allen headlock for non-rated ceilings.
- H. Access panels that are part of an integrated ceiling are specified in Section 09511: Acoustical Ceilings. Identification markers shall be affixed to adjacent supports, under this portion of Work, to indicate location and type of mechanical device to be serviced.
- I. Access panels installed in ducts or plenums located in heater or equipment rooms containing gas-fired equipment shall be furnished with heavy-duty spring closing hinges and refrigerator door type catches unless otherwise required. When these panels are intended for maintenance personnel access, catches shall be operable from both interior and exterior.
- J. Other access panels, except those specified above, shall be furnished with suitable hinges and one or more sash fasteners.
- K. Panels located in ducts and plenums shall be installed with gaskets made of synthetic rubber, felt, or similar material to provide an airtight installation. Panels shall be constructed and reinforced to prevent vibration.

- L. Letter words "FIRE DAMPERS" on panels over fire dampers and words "DO NOT OPEN - HEATER IS OPERATING" on panels located in heater or equipment rooms. Letters shall be approximately 3 inches high, if space is available.
- M. Furnish a key to operate latch access plates, one for each access plate, but not to exceed 5 keys for any one Project.
- N. Access plates and panels shall be furnished with manufacturer's name or trade mark and model number cast or stamped thereon, or upon a label permanently affixed thereon.
- O. Provide duct through roof flashing as detailed in the SMACNA standards or as indicated on Drawings.
- P. Refer to SMACNA Figures 2-12 and 2-13 for access plate and door construction.

3.18 PRESSURE TESTING

- A. Test and provide substantially airtight supply, return and exhaust ducts, plenums and casings at static pressure indicated for system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through senses of feeling or hearing at duct joints. Test ductwork for leaks at 1-1/2 times operating pressure but at a minimum of 2 inches of water.

3.19 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

3.20 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION 23 30 00

Part 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg. Metal ducts include the following:
 - 1. Rectangular ducts and fittings.
 - 2. Single-wall, round spiral-seam ducts and formed fittings.
 - 3. Double-wall, round spiral-seam ducts and formed fittings.
 - 4. Duct liner.
- B. Related Sections include the following:
 - 1. Division 15 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset FRP ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
 - 2. Division 15 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
 - 3. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.03 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.
- B. NUSIG: National Uniform Seismic Installation Guidelines.

1.04 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations

showing that proposed layout will provide original design results without increasing system total pressure.

1.05 SUBMITTALS

- A. Shop Drawings: CAD-generated and drawn to 1/4 inch equals 1 foot scale. Show fabrication and installation details for metal ducts.
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating sizes and pressure classes.
 - 3. Elevations of top and bottom of ducts.
 - 4. Dimensions of main duct runs from building grid lines.
 - 5. Fittings.
 - 6. Reinforcement and spacing.
 - 7. Seam and joint construction.
 - 8. Penetrations through fire-rated and other partitions.
 - 9. Equipment installation based on equipment being used on Project.
 - 10. Duct accessories, including access doors and panels.
 - 11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Other systems installed in same space as ducts.
 - 3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
 - 4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.06 Welding certificates.

1.07 Field quality-control test reports.

1.08 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. NFPA Compliance:
 - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 - 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- C. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.

Part 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.
- D. Stainless Steel: ASTM A 480/A 480M, Type 316, and having a No. 2D finish for concealed ducts and finish matching kitchen equipment for exposed ducts.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 DUCT LINER

- A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.

- 1. Manufacturers:

- a CertainTeed Corp.; Insulation Group.
- b Johns Manville International, Inc.
- c Knauf Fiber Glass GmbH.
- d Owens Corning.

- 2. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.

- e Thickness: 1 inch.

- f Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.

- g Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.

- h Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

- i Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

- 1) Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.

- 2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into air stream.

- 3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

- B. Flexible Elastomeric Duct Liner: Comply with NFPA 90A or NFPA 90B.

- 1. Manufacturers:

- a Armstrong World Industries, Inc.
- b Imcoa.

2. Materials: Unicellular polyethylene thermal plastic, preformed sheet insulation complying with ASTM C 534, Type II, except for density.
 - c Thickness: 1 inch.
 - d Thermal Conductivity (k-Value): 0.24 at 75 deg F mean temperature.
 - e Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM C 411.

fLiner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
3. Application: Ducts serving kitchen or food preparing areas.

2.04 SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
- B. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.
- C. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.
- D. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.05 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
 3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
 3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

2.06 RECTANGULAR DUCT FABRICATION

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
 2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
1. Manufacturers:
 - a Ductmate Industries, Inc.
 - b Ward Industries, Inc.
 - c Or equal.
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
1. Manufacturers:

- a Ductmate Industries, Inc.
- b Lockformer.
- 2. Duct Size: Maximum 30 inches wide and up to 2-inch wg pressure class.
- 3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
- D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

2.07 APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
- B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
- C. Butt transverse joints without gaps and coat joint with adhesive.
- D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
- G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
- H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - 1. Fan discharges.
 - 2. Intervals of lined duct preceding unlined duct.
 - 3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

- I. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - 1. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
- J. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.
- K. Install in first 15 feet of duct connected to units.

2.08 ROUND AND FLAT-OVAL DUCT AND FITTING FABRICATION

- A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.
- B. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
 - 1. Manufacturers:
 - a McGill AirFlow Corporation.
 - b SEMCO Incorporated.
- C. Duct Joints:
 - 1. Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
 - 2. Ducts 21 to 72 Inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
- D. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.
- E. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.
- F. Fabricate elbows using die formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-

1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:
 - a Ducts 3 to 36 Inches in Diameter: 0.034 inch.
 - b Ducts 37 to 50 Inches in Diameter: 0.040 inch.
 - c Ducts 52 to 60 Inches in Diameter: 0.052 inch.
 - d Ducts 62 to 84 Inches in Diameter: 0.064 inch.
3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
 - e Ducts 3 to 26 Inches in Diameter: 0.034 inch.
 - f Ducts 27 to 50 Inches in Diameter: 0.040 inch.
 - g Ducts 52 to 60 Inches in Diameter: 0.052 inch.
 - h Ducts 62 to 84 Inches in Diameter: 0.064 inch.
4. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single thickness turning vanes.
5. Round Elbows 8 Inches and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
6. Round Elbows 9 through 14 Inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
7. Round Elbows Larger Than 14 Inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
8. Die-Formed Elbows for Sizes through 8 Inches in Diameter and All Pressures 0.040 inch thick with 2-piece welded construction.

9. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
10. Pleated Elbows for Sizes through 14 Inches in Diameter and Pressures through 10-Inch wg: 0.022 inch.

Part 3 EXECUTION

3.01 DUCT APPLICATIONS

- A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
 1. Supply Ducts: 2-inch wg.
 2. Supply Ducts (before Air Terminal Units): 2-inch wg.
 3. Supply Ducts (after Air Terminal Units): 1-inch wg.
 4. Return Ducts (Negative Pressure): 1-inch wg.
 5. Exhaust Ducts (Negative Pressure): 1-inch wg.
- B. All ducts shall be galvanized steel except as follows:
 1. Range Hood Exhaust Ducts: Comply with NFPA 96.
 - a Concealed: Carbon-steel sheet.
 - b Exposed: Type 304, stainless steel with finish to match kitchen equipment and range hood.
 - c Weld and flange seams and joints.
 2. Dishwasher Hood Exhaust Ducts:
 - d Type 304, stainless steel with finish to match kitchen equipment and range hood. Weld and flange seams and joints.
 - e Aluminum, with seams and laps arranged on top of duct.
 3. Underground Ducts:
 - f Concrete encased galvanized steel.

3.02 DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

- B. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, size, and shape and for connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.
- F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."
- O. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

- P. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."
- Q. Paint interiors of metal ducts, that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.03 UNDERSLAB DUCTS, SPECIAL INSTALLATION REQUIREMENTS

- A. Verify undamaged condition of ducts before enclosure with fill or encasement.
- B. Protect ducts from damage by equipment used in placing fill materials and concrete on or around ducts.
- C. Protect duct openings from damage and prevent entrance of foreign materials.

3.04 RANGE HOOD EXHAUST DUCTS, SPECIAL INSTALLATION REQUIREMENTS

- A. Install ducts to allow for thermal expansion through 2000 deg F temperature range.
- B. Install ducts without dips or traps that may collect residues unless traps have continuous or automatic residue removal.
- C. Install access openings at each change in direction and at intervals defined by NFPA 96; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.
- D. Do not penetrate fire-rated assemblies except as permitted by applicable building codes.

3.05 SEAM AND JOINT SEALING

- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.
 - 1. For pressure classes lower than 2-inch wg, seal transverse joints.
- B. Seal ducts before external insulation is applied.

3.06 HANGING AND SUPPORTING

- A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
- B. Support vertical ducts at maximum intervals of 16 feet and at each floor.
- C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

- D. Install concrete inserts before placing concrete.
- E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

3.07 CONNECTIONS

- A. Make connections to equipment with flexible connectors according to Division 15 Section "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.08 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
 - 1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
 - 3. Determine leakage from entire system or section of system by relating leakage to surface area of test section.
 - a Allowable Leakage, Supply Duct Systems: 1 percent of design airflow.
 - b Allowable Leakage, Return Duct Systems: 2 percent of design airflow.
 - c Allowable Leakage, Exhaust Supply Duct Systems: 2 percent of design airflow.
 - d Allowable Leakage, Supply Duct Systems, Terminals to Air Outlets: 2 percent of design airflow.
 - 4. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg.

5. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

END OF SECTION 23 31 13

Part 1 GENERAL SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Volume dampers.
3. Turning vanes.
4. Duct-mounting access doors.
5. Flexible connectors.
6. Flexible ducts.
7. Duct accessory hardware.

B. See Division 16 Section "Fire Alarm" for duct-mounting fire and smoke detectors.

1.02 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Volume dampers.
3. Turning vanes.
4. Duct-mounting access doors.
5. Flexible connectors.
6. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Special fittings.
2. Manual-volume damper installations.
3. Combination fire- and smoke-damper installations, including sleeves and duct-mounting access doors.

4. Wiring Diagrams: Power, signal, and control wiring.

1.03 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

Part 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Stainless Steel: ASTM A 480/A 480M.
- D. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: ASTM B 221, alloy 6063, temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 BACKDRAFT DAMPERS

- A. Manufacturers:

1. Duro Dyne Corp.
 2. Ruskin Company.
- B. Description: Multiple-blade, parallel action gravity balanced, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.
- C. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
- D. Blades: 0.050-inch- thick aluminum sheet.
- E. Blade Seals: Neoprene.
- F. Blade Axles: Galvanized steel.
- G. Tie Bars and Brackets: Galvanized steel.
- H. Return Spring: Adjustable tension.

2.04 VOLUME DAMPERS

- A. Manufacturers:
1. Duro Dyne Corp.
 2. Ruskin Company.
- B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
- C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
 2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
 3. Blade Axles: Galvanized steel.
 4. Bearings: Oil-impregnated bronze.

- 5. Tie Bars and Brackets: Galvanized steel.
- D. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 - 1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
- E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.05 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.
- B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- wide, single-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.
 - 1. Manufacturers:
 - 2. Ductmate Industries, Inc.
 - 3. Duro Dyne Corp.
 - 4. METALAIRE, Inc.
 - 5. Ward Industries, Inc.

2.06 DUCT-MOUNTING ACCESS DOORS

- A. General Description: Fabricate doors airtight and suitable for duct pressure class.
- B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.
 - 1. Manufacturers:
 - a CESCO Products.

- b Ductmate Industries, Inc.
 - c Flexmaster U.S.A., Inc.
 - d Greenheck.
 - e McGill AirFlow Corporation.
 - f Ventfabrics, Inc.
 - g Ward Industries, Inc.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Provide number of hinges and locks as follows:
 - h Less Than 12 Inches Square: Secure with two sash locks.
 - i Up to 18 Inches Square: Two hinges and two sash locks.
 - j Up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
 - k Sizes 24 by 48 Inches and Larger: One additional hinge.
 - C. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
 - D. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.07 FLEXIBLE CONNECTORS

- A. Manufacturers:
 1. Duro Dyne Corp.
 2. Ventfabrics, Inc.
 3. Ward Industries, Inc.
- B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- C. Flexible Connector Fabric: Glass fabric double coated with neoprene.
 1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

3. Service Temperature: Minus 40 to plus 200 deg F.

2.08 FLEXIBLE DUCTS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Flexmaster U.S.A., Inc.
3. Hart & Cooley, Inc.
4. McGill AirFlow Corporation.

B. Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

2.09 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pilot tube and other testing instruments and of length to suit duct insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

Part 3 EXECUTION

3.01 APPLICATION AND INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

- C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.
- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.
- F. Provide test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.
- H. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
 - 1. On both sides of duct coils.
 - 2. Downstream from volume dampers, turning vanes, and equipment.
 - 3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
 - 4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot spacing.
 - 5. On sides of ducts where adequate clearance is available.
- I. Install the following sizes for duct-mounting, rectangular access doors:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body Plus Ladder Access: 25 by 17 inches.
- J. Install the following sizes for duct-mounting, round access doors:
 - 1. One-Hand or Inspection Access: 8 inches in diameter.
 - 2. Two-Hand Access: 10 inches in diameter.

- 3. Head and Hand Access: 12 inches in diameter.
- 4. Head and Shoulders Access: 18 inches in diameter.
- 5. Body Access: 24 inches in diameter.
- K. Label access doors according to Division 15 Section "Mechanical Identification."
- L. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
- M. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers or light troffer boots to low pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- O. Connect flexible ducts to metal ducts with draw bands.
- P. Install duct test holes where indicated and required for testing and balancing purposes.

3.02 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire and smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION 23 33 00

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.02 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
- (1) Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
 - (2) Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- (1) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - (2) Products: Subject to compliance with requirements, provide one of the products specified.
 - (3) Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - (4) Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 GRILLES AND REGISTERS

- A. Fixed Face Register RAR - #:

- (1) Products:
 - a. Titus; 350 FL.

- (2) Manufacturers:
 - a. Titus.
 - b. Kreuger
 - c. Metal-Aire
- (3) Material: Aluminum.
- (4) Finish: Baked enamel, white.
- (5) Frame: 1 inch wide.
- (6) Mounting: Concealed or Lay in to match ceiling type.
- (7) Accessories:
 - a. Provide 24 x 24 filler panel for registers in T-bar ceilings.

2.03 CEILING DIFFUSER OUTLETS

A. Rectangular and Square Ceiling Diffusers CD - #:

- (1) Products:
 - a. Titus; MCD.
- (2) Manufacturers:
 - a. Titus.
 - b. Kreuger
 - c. Metal-Aire
- (3) Material: Aluminum.
- (4) Finish: Baked enamel, white .
- (5) Mounting: To match ceiling type.
- (6) Pattern: Adjustable 4 way.
- (7) Accessories:
 - a. Provide 24 x 24 filler panel for diffusers in T-bar ceiling.

B. Specialty Diffuser SD-#

- (1) Products:
 - a. Seiho PK
- (2) Manufacturers:
 - a. Seiho
- (3) Material: Aluminum.
- (4) Finish: Anodized aluminum.
- (5) Mounting: Surface.
- (6) Dampers: Adjustable blade.
- (7) Accessories:
 - a. Neoprene gasket.

2.04 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- D. Paint behind registers with two coats of flat black paint.

3.02 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Indoor and outdoor air handling units.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 23 0500: Common Work Results for HVAC.
3. Section 23 0513: Basic Mechanical Materials and Methods.
4. Section 23 0548: Mechanical Sound, Vibration and Seismic Control.
5. Section 23 0700: Mechanical Insulation.
6. Section 23 8000: Heating, Ventilation and Air Conditioning Equipment.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA):

1. AMCA 211 – Certified Ratings Program - Product Rating Manual for Fan Air Performance.
2. AMCA 300 – Reverberant Room Method for Sound Testing of Fans.
3. AMCA 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

B. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):

1. AHRI 410 – Forced Circulation Air-Cooling and Air-Heating Coils.

C. American Society for Testing and Materials International (ASTM):

1. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
2. ASTM D2247 – Standard Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity.

3. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. National Fire Protection Association (NFPA):
1. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems.
- E. Underwriters Laboratories, Inc. (UL):
1. UL 181 – Standard for Factory-Made Air Ducts and Air Connectors.
 2. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.
 3. UL 1995 – Heating and Cooling Equipment.
- F. Underwriters Laboratories of Canada (ULC):
1. CAN/ULC-S102.2 – Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
- G. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
1. ASHRAE Standard 62.1 – Ventilation for Acceptable Indoor Air Quality.
- H. National Electrical Manufacturers Association (NEMA):
1. NEMA – MG 1, Table 12-10: NEMA Threshold Full-Load Nominal Efficiency Values for Energy-Efficient Motors.

1.03 DEFINITIONS

- A. Hereinafter, a Class "A" thermal break shall be defined as a thermal break that ensures no member on the exterior of the unit, including fasteners, has through metal contact with any member on the interior of the unit, including fasteners.
- B. Hereinafter, wall assemblies shall include all unit wall panels around the air tunnel perimeter, all channels exposed to both the interior and exterior of the unit, and all removable wall access panels.
- C. Hereinafter, door assemblies shall include interior and exterior unit door panels, door frames, and door channels.

- D. Hereinafter, roof assemblies shall include exterior unit roof panels, interior unit ceiling panels, and all roof channels exposed to both the interior and exterior of the unit.

1.04 SCOPE OF WORK

- A. The AHU Manufacturer's work shall include, but is not necessarily limited to the following:

1. Furnish a complete set of submittals as described hereinafter.
2. Provide AHUs fully factory assembled with the exception of unit splits as required for shipping or installation requirements as determined by the installing contractor. As shipped from the AHU Manufacturer, AHUs shall meet the performance requirements shown on the equipment schedule. Units shall be for outdoor application and shall have all components and options as indicated on the schedule or drawings. Furthermore, units shall be constructed as detailed hereinafter. Field-provide components and options shall be unacceptable unless otherwise noted.
3. Provide all labor, materials, and equipment necessary for the complete engineering, production, factory assembly, factory testing, packaging, and delivery of the custom AHUs and their related equipment. Controls contractor to provide control end devices and unit controllers, for factory mounting and wiring.
4. Permit the Owner and Engineer to inspect as herein described and to witness performance tests to ensure good product quality and compliance with these specifications.
5. Factory test all AHUs as detailed herein and on the schedule.
6. Provide a factory-authorized service representative employed by the AHU Manufacturer to supervise installation and start-up of the units as herein described.
7. Provide Owner's Manual, complete operating instructions.

- B. Mechanical Contractor whose work will generally include the following:

1. Receive and unload the custom AHUs. Inspect the unit sections as they arrive on the job site. Notify the trucking company, AHU Manufacturer, and Owner of any shipping damage immediately.
2. Coordinate all work associated with the AHU installation. Schedule with the AHU Manufacturer for a factory-authorized service person employed by the AHU Manufacturer to supervise unit installation. Clear area where unit is to be set of any construction materials or

debris. Ensure equipment curbs or support platforms are level prior to setting the units. Hoist and set units in their proper position. Use spreader bars to hoist the unit (sections) to avoid damaging units. If units ship in multiple sections, provide all labor and equipment for placing and field joining sections.

3. Provide all final chilled water, hot water, glycol water, steam, and drain piping connections. Release the fan spring isolator shipping restraints.
4. Remove all foreign objects and thoroughly clean the interior and exterior surfaces of the units with a mild detergent (soap and water). Do not use any abrasives or solvents without first consulting the AHU Manufacturer.
5. Install filter media in filter frames. Operating units without filter media is strictly prohibited.
6. Perform unit start up as detailed herein under the guidance and supervision of a factory-authorized service person employed by the AHU Manufacturer.

C. Electrical Contractor work will generally include the following:

1. Provide wiring between Owner's normal/emergency power source and the units.
2. Perform unit start up as detailed herein under the guidance and supervision of a factory-authorized service person employed by the AHU Manufacturer.

1.05 BID REQUIREMENTS

- A. The AHUs shall meet the performance criteria as indicated on the schedule and drawings.
- B. Base Bid AHU Manufacturers: Alliance (Basis of Design), PACE, Solutions.
- C. Naming of manufacturers does not imply that their standard construction is acceptable, nor does it imply that their products are automatically approved. A manufacturer who is not the basis of design is required, 14-days prior to bid, to submit to the mechanical engineer, proposed equipment, along with a comparison letter addressing each item in the specification and stating compliance with the specifications. This proposed submittal must be approved in writing by the mechanical engineer a minimum of 3- days prior to bid date. Approval will be at the discretion of the mechanical engineer. There shall be no exceptions to this requirement, and submittals of manufacturers who have not obtained written approval prior to bid will be rejected without review, and returned. The Mechanical Contractor shall be

responsible for all additional costs incurred by the Engineer during the submittal and re-submittal phases for any contract awarded to a manufacturer not on the approved list.

- D. All AHU Manufacturer's that are not basis of design shall deliver selection data to the bid examiner. Selection shall include the following:
 - 1. Fan performance curves, coil performance, and unit discharge, inlet, and certified radiated sound power levels.
 - 2. Unit casing thermal performance at design supply air temperature graphed on a psychometric chart.
 - 3. A list of all exceptions and clarifications the AHU Manufacturer is taking to the specifications.
- E. To ensure injected closed-cell foam is properly engineered for rigidity and thermal performance, is amply applied to fill all cavities within each assembly, and is correctly cured to yield strong adhesion to casing members, the AHU Manufacturer shall have experience using injected closed-cell foam as an insulation in AHUs for no less than 5 years.
- F. Mechanical contractor shall carry full responsibility for any AH equipment that don't fit or don't meet the acoustical requirements of each designated area, at its own expense acoustical traps or leak test shall be done for any field modification.
- G. Contractor shall bare additional cost for new structural & acoustical calculations by using another listed brand.

1.06 SUBMITTALS

- A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Owner or Owner's approved representative.
- B. AHU Manufacturer shall provide the following information with each shop drawing/product data submission:
 - 1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, support locations, and weights. Drawings shall also indicate all electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations. Each component of the unit shall be identified and shall include physical dimensions and material of construction.
 - 2. Panel-to-panel joint and corner details and panel-to-roof details, all showing Class "A" thermal breaks.

3. All performance data, including capacities and airside and waterside pressure drops, for components. AMCA-certified fan curves shall be provided with specified operating point clearly plotted. AMCA-certified sound power level data for fan inlet and outlet at fan rated capacity shall be provided. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, and 4000 Hz based on AHRI 260 fan in unit testing.
 4. Brand and model of fans, fan motors, coils, air filters, dampers, outside and return air measuring stations, and unit DDC controllers being furnished.
- C. The AHU Manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.
- D. The AHU Manufacturer shall list any exceptions to the specification.

1.07 WARRANTY AND SERVICE

- A. AHU Manufacturer shall provide a parts & labor warranty extending 12 months from start-up or 18 months from shipment, whichever comes first.
- B. The AHU Manufacturer shall have a service department located within 50 miles of the job site, and 4 hour respond 24/7.

1.08 QUALITY ASSURANCE

- A. Qualifications of Manufacturers and Installers: Comply with provisions in Section 23 0500: Common Work Results for HVAC.
- B. Sound Level Measurements and Calculations:
1. Sound power level measurements and calculations shall be made in complete accordance with latest version of AMCA Standard 300, Methods for Calculating Fan Sound Ratings from Laboratory Test Data, and AMCA Standard 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
 2. The results of all testing shall be certified by independent testing agency or an AMCA-approved testing laboratory and submitted to architect for approval. The submittal shall include a complete description of test conditions, methods and procedures, including specific installation type used for measurements, as detailed in AMCA 300.

- 3. Maximum Allowable Sound Power Levels: Maximum allowable sound power levels for supply discharge, return intake, and casing radiated noise shall not exceed values given in schedule below as indicated on drawings with equipment operating at design airflow and static pressure conditions.
- C. Factory Leak Testing: Manufacturer shall provide a factory leak test on units at design total static pressure across the cabinet exterior walls. Cabinet leakage shall not exceed 1 percent of specified airflow on the operating side of the unit. All panels shall be sealed with closed cell gasketing material. A written test report shall be prepared by the manufacturer and submitted to the Architect.
- 1.09 PROJECT RECORD DOCUMENTS
 - A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 0500: Common Work Results for HVAC.
- 1.10 PRODUCT HANDLING
 - A. Protection, Replacements, Delivery and Storage: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC.
- 1.11 COORDINATION
 - A. Coordinate related and adjacent activities in accordance with provisions of Section 01 3113: Project Coordination.
- 1.12 WARRANTY AND SERVICE
 - A. AHU Manufacturer shall provide a parts & labor warranty extending 12 months from start-up or 18 months from shipment, whichever comes first.
 - B. The AHU Manufacturer shall have a service department located within 50 miles of the job site, and 4 hour respond 24/7.

PART 2 – PRODUCTS

- 2.01 PACKAGED AIR HANDLING UNIT: AGENCY LISTING
 - A. AHUs shall be agency listed to UL 1995 by UL or ETL.
 - B. Manufacturer: York, Carrier, or approved equal.

2.02 UNIT NAMEPLATES AND LABELS

- A. Metal nameplates shall be provided on the units. All information contained on the nameplate shall be etched or burned into the surface to prevent fading. Information shall include:
 - 1. Job name, sales order number, unit tagging, and service model number.
 - 2. MCA, MOP, and maximum fuse/HACR circuit breaker size.
 - 3. Voltage, frequency, phase, Hp, FLA, and inverter input current for all motors.
- B. Labels for AHRI Standard 410 and the listing agency, either UL or ETL, shall be provided on the units.
- C. Labels shall be provided on the units for unit rigging and coil piping and connection instructions. Labels shall be provided on fans indicating direction of rotation. Warning labels shall be provided on appropriate components indicating hazardous voltage. For each section which must be assembled to another, matching steel identification tags shall be welded at each mating joint to ensure correct assembly order.

2.03 UNIT CONSTRUCTION

- A. Casing Performance
 - 1. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
 - 2. Casing deflection shall not exceed $L/200$ at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.
 - 3. Under scheduled supply air temperature and design conditions on the exterior of the unit of 79°F dry bulb and 68°F wet bulb, condensation shall not form on the casing exterior. The AHU Manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU Manufacturer shall provide, in writing, a guarantee against condensation forming on the unit exterior under the scheduled supply air temperature and design conditions on the exterior of the unit of 79°F dry bulb and 68°F wet bulb. The guarantee shall note that the AHU Manufacturer will cover all expenses associated with modifying

units in the field should external condensate form on them. Copies of the guarantee shall be provided to the Engineer and the Owner.

4. IBC Seismic Certification

- a. All AHUs shall be certified for seismic applications in accordance with the following International Building Code (IBC) releases: IBC 2000, 2003, 2006, 2009.
- b. Seismic qualification testing and structural analysis shall be conducted in accordance with and strict adherence to the standards set forth within ASCE 7 by an independent approval agency with a complete list of certified models, options, and installation methods provided in an approved detailed report. The AHUs shall be approved for seismic applications when properly installed and used as intended. The basis of the certification shall be obtained through a combination of testing of the active and energized components per AC156, and analysis of the main force resisting members of the unit. Additional calculations shall be conducted to ensure components, accessories, and options remained intact and attached to the unit under seismic load conditions.
- c. The certification shall be based on a maximum Design Structural Response Acceleration at Short Period (Sds) value of 1.85 g's for IBC 2006 and 2009, and 1.93 g's for IBC 2000 and 2003. This is obtained from the Maximum Considered Earthquake Short Period Spectral Response Acceleration, Ss, of 2.78 g's or 2.90 g's as determined by the ASCE 7 seismic maps for Soil Site Class B with 5 percent damping. When the site soil properties or final equipment installation location are not known, the soil site coefficient, Fa, defaults to the Soil Site Class D coefficient. Occupancy Category IV and Seismic Design Category C shall be covered under this certification, limited by the Sds value stated above. A seismic importance factor, Ip, of 1.5 shall apply to the certification to include essential facility requirements and life safety applications for post event functionality.
- d. For IBC 2000 and 2003, $FP/WP = 0.4 \times 2/3(S_s=2.90) \times (F_A=1) \times (I_P=1.5) \times (\alpha_P/RP=0.40) \times (1+2(z/h=1.0)) = 1.39 \text{ g's}$. For IBC 2006 and 2009 $FP/WP = 0.4 \times 2/3(S_s=2.78) \times (F_A=1) \times (I_P=1.5) \times (\alpha_P/RP=0.42) \times (1+2(z/h=1.0)) = 1.39 \text{ g's}$
- e. Structural floors, housekeeping pads, supporting curbs, and supporting steel must be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads. Installation details such as

special inspection, attachment to a curb, or attachment to a non-building structure must be outlined and approved by the Engineer of Record for the project or building. The installing contractor shall be responsible for the proper installation of the equipment and must observe the seismic installation requirements set forth by the Engineer of Record.

B. Bases & Floors

1. Base shall be construction from welded structural aluminum channels around the perimeter and welded structural aluminum cross members. Formed channels are not acceptable. The structural aluminum base shall be shot blasted, fully welded and then painted. The maximum cross-member spacing shall be 24" on center with members located adequately to support fan, coils, and other large components. The height of each base channel shall be no less than the height indicated in the drawings. Each shipping section shall be provided with removable lifting lugs. Structural framework shall fully support the unit casing and all components during installation such that no section deflects more than $L/1000$ during rigging of that section, where L is defined as the distance between lifting lugs.
2. AHU Floor shall be constructed from 0.063" aluminum safety tread plate surface. The floor surface shall be continuously welded with 2" turned up lip around the base perimeter and all floor penetrations. Caulk is not an acceptable sealing method for the floor. Floor drains shall be located in the floor to drain all sections. Floor drains shall be a minimum of 1.5" in diameter and shall be piped to the exterior of the unit base. Floor deflection shall not exceed $L/200$ under a point load of 200 pounds, where L is defined as the floor span. A 0.025" thick aluminum liner shall be attached to the underside of the unit base and cross members, ensuring that the floor insulation is completely encapsulated.
3. Insulation that meets a minimum R-value of 12.5 shall be minimum 2" thick and shall be provided underneath the entire unit floor. Insulation shall be closed-cell foam to prevent wicking of moisture. Insulation shall completely fill the panel cavity in all directions so that no voids exist. Base assemblies shall comply with NFPA 90 A.
4. Safety grates that provide a walking surface shall be provided across all bottom air openings. Safety grates shall support a minimum 300-pound load. Safety grates shall be made of Type IWA welded rod with a cross flow pattern of 1.1875" x 4". Grating shall be aluminum construction for units with aluminum floors. Safety grates shall be removable to ensure adequate access to the ductwork below.

C. Walls

1. Wall assemblies shall be double-wall construction with 0.063" thick textured aluminum solid exterior and 0.025" thick smooth aluminum interior. The entire unit shall have a solid wall aluminum liner on the interior, except for the fan section, which shall have perforated wall liner. All spaces and joints of wall assemblies shall be completely sealed. Wall shall meet the casing deflection limits contained herein. Bolting of wall panels shall be 304 stainless on maximum 8" centers. Sheet metal or Tek fasteners are not acceptable for sealing pressure containing panels.
2. A Class "A" thermal break shall be provided throughout the entire wall assembly.
3. Insulation that meets a minimum R-value of 12.5 shall be minimum 2" thick with minimum 1.5 pound/cu.ft density, and shall be provided throughout all unit wall assemblies. Insulation shall be fiberglass and completely wrapped with long-strand fiberglass cloth to limit the entrainment of moisture into the insulation. The long-strand fiberglass cloth shall also incorporate an anti-microbial coating to suppress microbial growth. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Wall assemblies shall comply with NFPA 90 A.
4. Removable wall access panels shall be provided in coil and fan sections for service removal of components. A Class "A" thermal break shall be provided throughout all removal wall access panels.
5. Fan sections shall include 0.025" perforated aluminum interior sheet metal liners in fan blast area. Insulation in sections lined with perforated sheets shall be faced with neoprene.
6. Cooling coil and direct evaporative sections shall include 20 gauge 304 stainless steel liner.
7. All floor openings shall have 1" minimum flange up around entire perimeter.

D. Access Doors

1. Access doors shall be provided throughout units as indicated on the schedules and drawings. Access doors shall be double wall construction. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels, respectively.
2. A Class "A" thermal break shall be provided on all door assemblies downstream of the cooling coil.
3. Insulation that meets a minimum R-value of 12.5 shall be provided throughout all door assemblies. Insulation shall be injected foam.

Foam shall be closed cell to prevent wicking of moisture. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Door assemblies shall comply with NFPA 90 A.

4. All doors shall be a minimum of 60" high if sufficient height is available, or the maximum height allowed by the unit height. All doors shall open against pressure to ensure an airtight seal and to prevent a safety hazard.
5. Door hinges shall be die-cast zinc with provision for adjustment without the use of shims or special tools. Door latches and handles are to be bolted to the unit and made with corrosion resistant materials. Bolts, nuts and shafts for door latches, handles and hinges shall be made of zinc plated steel. Door latch and pawl assembly shall be industrial quality and corrosion resistant with a handle on both the inside and outside of door. Latching mechanism shall be of conical roller design. Latch and pawl assembly shall be bolted together without the use of set screws. All doors to fan sections shall be provided with latches which require a tool to open.
6. Windows shall be provided on doors in fan sections. Windows shall be mounted in a metal frame and shall be a minimum of 8" x 8", with wire-reinforced safety glass. For any instance where a window cannot fit in a door, a narrower window 8" tall may be provided. Windows in doors with a thermal break shall be thermal, double-pane type.

E. Roofs

1. Roof assemblies shall be double wall construction. Exterior roof panels and interior ceiling panels shall be of the same construction as the exterior and interior wall panels, respectively. Sections in units with perforated interior wall liners shall have perforated interior ceiling liners. For perforated liners, a triple-wall panel shall be provided. This triple-wall panel shall be constructed such that two layers of the panel are solid, with the afore-mentioned class of thermal break between them to isolate the supply air from contact with the outside panel. The third, inner liner shall be perforated. All spaces and joints of roof assemblies shall be completely sealed. In addition to meeting the casing deflection limits contained herein, roof deflection shall not exceed $L/200$ under a point load of 200 pounds, where L is defined as the roof panel span.
2. Outdoor unit roofs shall incorporate a standing seam on the exterior to ensure a rigid roof construction. Outdoor roofs shall be sloped, not less than 1/4" per foot for water drainage. Where outdoor units are shipped in multiple sections, provide standing-seam joiners at each split with adhesive, hardware, and cover strips for field joining by the

installing contactor. On outdoor units, rain gutters shall be provided over all doors to direct rain away from the door assembly.

3. Shall be a single piece top panel.
4. Shall be embossed to increase rigidity and prevent sagging.

F. Shipping Splits

1. Shipping splits shall be provided as indicated on the schedule and drawings. Heavy-gage gussets shall be provided in the corners of each split on the unit interior to minimize the opportunity for racking of the section during shipping and rigging. Structural members shall be provided at the base of the unit exterior to enable pull together of each shipping split.

G. Condensate Pan and connections

1. Shall be an internally sloped condensate drain pan made of a non corrosive material.
2. Shall comply with ASHRAE Standard 62.
3. Shall use a 3/4" NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.

2.04 UNIT COMPONENTS

A. Dampers

1. Approved manufacturers: TAMCO, Ruskin.
2. Damper Sections: Dampers shall be low leakage type with airfoil blade design. All dampers shall carry the AMCA Standard 500 certification label. Air leakage through a 48" x 48" damper shall not exceed 10 CFM/ft².
3. Blade gasket shall be extruded EPDM elastomer secured in an integral slot within the aluminum extrusion. Frame seals shall be extruded TPE thermoplastic. Overlapping blade design shall compress seals to ensure tight seal on closure.
4. Damper frame shall be extruded aluminum with a thickness of not less than .080" and a depth of 4". Pivot rods shall be 7/16" hexagon extruded aluminum interlocking into blade section.
5. Bearings shall be double seal with an inner bearing fixed to the rod within a polycarbonate outer bearing inserted into the frame so that

the outer bearing cannot rotate. Bearings shall be designed so that there is no metal to metal contact.

6. Linkage hardware shall be installed outside of the frame and constructed of corrosion resistant aluminum and zinc plated steel.

B. Air Filters

1. Approved manufacturers: Flanders, American Air filters, and Farr.
2. All filters shall be 12" x 24", 24" x 24", 24" x 20", or 20" x 20" nominal sizes to minimize the number of sizes required to be stocked by the Owner. Filters of other nominal sizes will not be acceptable.
3. Prefilters shall be minimum 2" thick, pleated disposable type. Prefilters shall be UL Class 2 when tested in accordance with UL Standard 900
4. Medium Efficiency mini Pleat Media Filters or rigid box filters
 - a. Pleated media filters 4" or 12" deep shall be provided as indicated on the schedule and drawings. The MERV 13 rating shall be tested in accordance with ANSI/ASHRAE 52.2. Filter media shall be of non-woven fibers with metal grid support. Filters shall be provided with an anti-microbial coating. One set of extra filters shall be provided with each unit.
 - b. Filters shall be UL Class 2 when tested in accordance with UL Standard 900.
5. Filters shall be provided with front-loading frames. Filter holding frames shall be constructed of stainless steel and equipped with foam gaskets to seal filters against filter frames. Frame seams shall be sealed to eliminate air bypass. Front-loading frames shall be equipped with filter fasteners of the same material as the filter frame. Filter fasteners shall be capable of being installed without the use of special tools, bolts or nuts. Filter holding frames shall be of a universal type to accommodate standard filters of the same nominal size as well as appropriate fasteners. Filter access shall be as indicated on the schedule and drawings.
6. A Digihelic differential pressure gauge shall be provided factory installed for measuring the
7. pressure drop across each filter bank. The gauge shall be a diaphragm-actuated dial type, 4¾" O.D., with white dial, black figures and graduations and pointer zero adjustment.

C. Refrigerant Coils

1. Coil performance shall be provided as indicated on the schedule and drawings. Coil capacities, pressure drops and selection procedures shall be certified to AHRI Standard 410.
2. DX coil performance, circuiting, hot gas bypass line and piping layout shall be selected in accordance with the condenser unit requirements.
3. Refrigerant shall be 410A or other Enviro-safe types.
4. DX coils shall be provided as indicated on the schedule and drawings.
5. DX coils shall have 0.006" thick copper fins. Fins shall be mechanically bonded to 3/8" OD seamless copper tubes with 0.020" thick walls. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion. All returns bends shall have a minimum wall thickness of 0.025" and shall be brazed and individually removable. Hairpin return bends are not allowed. Coils shall be circuited for counter-flow heat transfer. Coil casings shall be constructed of stainless steel.
6. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Unit shall use a Thermostatic Expansion Valve (TXV) or orifice for refrigeration control.
 - b. TXV shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
 - c. Refrigerant filter drier Solid core design.
 - d. Service gauge connections on suction and discharge lines.

C. Compressors

1. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.
2. Two stage 6 ton> units shall use fully hermetic, 2-stage compressors.
3. Three stage 7.5-12.5 ton units shall use one fully hermetic 2 stage compressor and one fully hermetic scroll compressor.
4. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
5. Compressors shall be internally protected from high discharge temperature conditions.
6. Compressors shall be protected from an over temperature and over amperage conditions by an internal, motor overload device.
7. Compressor shall be factory mounted on rubber grommets.

8. Compressor motors shall have internal line break thermal, current overload and high-pressure differential protection.
9. Crankcase heaters shall not be required for normal operating range, unless provided by the factory.

D. Primary Drain Pans

1. Primary condensate drain pans shall be provided in cooling coil sections as detailed in the drawings. Drain pans in cooling coil sections shall be 304 stainless steel. Primary drain pans shall extend under each entire coil bank, including headers and return bends. Primary drain pans shall extend downstream of the coil bank for a minimum distance as indicated in the drawings. Primary drain pans shall be sloped a minimum of 1/8" per foot, shall be a minimum of 2" deep, and shall be double-sloped (sloped in 2 planes) to positively drain. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum of 1-1/2" beyond the base to ensure adequate room for field piping of condensate drain traps. Drain connection locations (handing) shall be as indicated on the schedule and drawings. Any coil support member located inside a primary drain pan shall be of the same material as the drain pan. Coil drain pans shall be supported by structural aluminum members under the floor.

6. Intermediate Drain Pans

- a. For cooling coil sections requiring stacked coils, sloped intermediate drain pans constructed of stainless steel shall be provided under each upper-level coil in the coil bank and shall extend under the entire coil, including headers and return bends. Intermediate drain pans shall extend downstream of the leaving face of the coil bank for a minimum of 4". Non-corrosive pipe with a minimum diameter of 1" shall be connected to each end of all intermediate drain pans, and shall be piped to the primary drain pan of the coil section. Any coil support member located inside an intermediate drain pan shall be of the same material as the drain pan.

D. Fans

1. Fan shall be SWSI Direct drive arrangement 4 as indicated on the schedule, minimum Class 2. Wheels are high efficiency, non-overloading type backward inclined airfoil blade design. Wheels contain 9 blades and are constructed from extruded aluminum. Fans shall be designed with reinforced steel inlet plate, structural steel frame, shaft, and bearings. Each fan assembly, including sheaves and belts, shall be trim balanced at the factory in accordance with ANSI

204-96 to Balance Quality Grade G6.3. Fans shall be rated in accordance with AMCA Standard 210 for air performance and AMCA 300 for sound. All fans shall carry the AMCA certification label

2. Fans shall be isolated with manual blankoffs to prevent backflow in the event of individual fan failure.
3. Nameplate motor horsepower for all fans, including dual fans, shall be at least 10% greater than design brake horsepower of each fan.
4. Motors shall be premium efficiency, NEMA Design B, TEFC, with Class B insulation. Minimum service factor shall be 1.15 and motors shall not be selected to operate in the service factor. Each fan/ fan array shall be provided with a VFD, as well as a redundant VFD with automatic switchover.
5. Aegis SGR motor bearing protection ring kit provided for each motor that is connected to a VFD. Protects motors from catastrophic failure and channels harmful VFD induced shaft currents to ground.
6. Fan Air Flow Measuring Stations: The flow measuring station shall consist of total pressure taps located in the inlet cone of each fan, with static pressure tap located near fan inlet panel. Any flow measuring device which creates an obstruction in the fan inlet is not acceptable. Provide a Dwyer magnehelic pressure gauge with CFM scale which indicates the fan volume. Flow gauges shall be calibrated to match the flow coefficient of the fan inlet cone provided. Provide a DH3 Digihelic differential pressure switch for each fan. The transmitter shall produce a 4 – 20 mA or 0 – 5 Vdc signal linear and scaled to air volume or velocity. The transmitter shall be capable of withstanding over pressurization up to 200 times greater than span and shall be factory calibrated.
7. Fan Assembly Isolation Base: Fan and motor shall be mounted on an integral fully welded structural base. Base shall be free floating at all four corners on spring type isolators with earthquake restraints rated for Seismic Zone 4 requirements. Isolator spring deflection shall be 2" minimum or as indicated on specifications. Isolator supports shall be attached to base structural members, and welding to the floor skin is not acceptable.
8. Evaporator Fans:
 - 1) Shall be standard belt drive assembly with an adjustable pitch motor pulley.
 - a) Direct drive fan is selectable option in 3-5 ton models
 - 2) Shall use sealed, permanently lubricated ball bearing type.

3) Blower fan shall be double inlet type with forward curved blades.

4) Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

9. Condenser Fans:

1) Shall be a direct driven propeller type fan.

2) Shall have aluminum blades riveted to corrosion resistant steel spider brackets and be dynamically balanced.

E. Fan Motor

1. Evaporator Fan Motor

a) Shall have Permanently lubricated ball-bearings

b) Shall have inherent automatic reset thermal overload protection.

c) The job site selected brake horsepower shall be required to not exceed the motor's nameplate horsepower rating plus the service factor.

9. Condenser Fans:

1) Shall be a totally enclosed Motor.

2) Shall use permanently lubricated ball-bearings.

3) Shall have inherent thermal overload protection with an automatic reset feature.

4) shall have a shaft down design.

E. Service Lighting and Convenient Outlet: Guarded vapor proof marine lights factory wired to a single weatherproof switch located on exterior of cabinet. Provide weatherproof, 15 amps, GFCI receptacle near the light switch wired to the lighting circuit.

F. Outside air intake

1. Provide air flow measuring station for outside air intake. Provide transmitter with digital readout and analog output for BMS.

2. Either extruded aluminum louvers or weatherhoods shall be used at outside air intake location. Louvers shall be stationary, wind driven rain resistant drainable type with built in downspouts and furnished with

birdscreen. Blades shall be vertical and housed inside an aluminum frame mounted to the unit exterior. Weatherhoods shall be fabricated from aluminum and painted the same finish as unit exterior. Weatherhood openings are lined with 1/2" galvanized mesh bird screen. Weatherhoods are designed for 750 fpm maximum face velocity.

- G. Electrical Wiring: Provide single point power connection with a non-fused manual disconnect of the proper amp rating in the control cabinet for each air handling unit. Provide factory power wiring from VFD's to the fan motors. Provide redundant VFD's with automatic switchover, factory mounted and wired. Provide copper wires, bus bars, and fittings throughout. Identify power supply terminals with permanent markers. The maximum temperature of terminals shall not exceed 167 degrees F when the equipment is tested in accordance with its rating. All wiring (460V, 120V and 24V) shall be in conduit. Separate terminal shall be provided for 120V power connection for service lights and convenience outlets. A separate 120V power source shall be coordinated with Division 26 –Electrical. Separate terminal shall be provided for 120V power connection for controls. A separate 120V power source shall be coordinated with Division 26 –Electrical.
- I. Unit mounted controls shall be installed by controls contractor. All end devices and control boards shall be provided by the temperature controls contractor. All wiring must be in conduit.
- J. Paint Finish: Exterior wall and roof panels shall be coated with polyurethane to a minimum dry thickness of 3 mils. Finish shall have no blistering or rusting on unscribed areas after 10,000 hours in accordance with ASTM B-117 salt fog test. Entire structural base shall be primer painted with industrial grade epoxy primer for total thickness of 4
- K. Furnish programmable digital thermostat/controller. Control shall be tied to existing EMS system.
- L. M. Special Features Options and Accessories
 - 1. Standard Integrated Economizer:
 - a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory installed option.
 - c. Damper blades shall be galvanized steel with metal gears. Plastic or composite blades on intake or return shall not be acceptable.
 - d. Damper blades shall be class 1A dampers.

- e. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
- f. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
- g. Economizer shall comply with, and be certified to, the AMCA 511 standard.
- h. Standard leak rate shall be equipped with dampers not to exceed 3 cfm/ft² leakage at 1 in. wg pressure differential.
- i. Economizer controller shall be the Johnson Controls SE Economizer Controller
 - 1) On board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, meets the requirements for California Title 24, IECC 2015, and ASHRAE 90.1.
 - 2) Sensor failure loss of communication identification
 - 3) Automatic sensor detection
 - 4) Capabilities for use with multiple speed indoor fan systems
 - 5) Utilize digital sensors: Dry bulb and Enthalpy
 - 6) UL, CSA, and ICES-003 recognized and FCC compliant to CFR47
- j. Shall be capable of introducing up to 100% outdoor air.
- k. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements. Barometric relief can be replaced by optional power exhaust.
- l. Shall be designed to close damper(s) during loss of power situations with spring return built into motor.
- m. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory installed only. Outdoor air sensor set point shall be adjustable and shall range from 40° to 80°F / 4° to 27°C. Additional sensor options shall be available as accessories.
- n. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
- o. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
- p. Dampers shall be completely closed when the unit is in the unoccupied mode.

- q. Economizer controller shall accept a 2 10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
 - r. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
 - s. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
2. Barometric Relief Kit
 - a. Shall contain all materials necessary to field install a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.
 3. Manual Fresh Air Damper
 - a. Shall contain all materials necessary to field install a manual fresh air damper.
 - b. Shall include a slide-in damper assembly with an outdoor hood and filters.
 - c. Shall be available with either a range of 0%-100% outdoor air entry or 0%-35% outdoor air entry.
 4. Motorized Damper
 - a. Damper shall be a Two Position Damper. Damper travel shall be from the full closed position to the field adjustable % open set point.
 - b. Damper shall include adjustable damper travel from 0% to 100% (full open).
 - c. Damper shall include single or dual blade, gear driven dampers and actuator motor.
 - d. Actuator shall be direct coupled to damper gear. No linkage arms or control rods shall be acceptable.
 - e. Damper will admit up to 100% outdoor air for applicable rooftop units.
 - f. Damper shall close upon indoor (evaporator) fan shutoff and/or loss of power.
 - g. The damper actuator shall plug into the rooftop unit's wiring harness plug. No hard wiring shall be required.
 - h. Outside air hood shall include aluminum water entrainment filter.
 5. Manual damper

- a. Manual damper package shall consist of damper, air inlet screen, and rain hood which can be preset to admit up to 25 or 50% outdoor air for year round ventilation.
- 6. Unit Mounted, Non Fused Disconnect Switch:
 - a. Switch shall be factory installed, internally mounted.
 - b. National Electric Code (NEC) and UL approved non fused switch shall provide unit power shutoff.
 - c. Shall be accessible from outside the unit.
 - d. Shall provide local shutdown and lockout capability.
- 7. Convenience Outlet:
 - a. Powered convenience outlet.
 - 1) Outlet shall be powered from main line power to the rooftop unit.
 - 2) Outlet shall be factory installed and internally mounted with easily accessible 115 v female receptacle.
 - 3) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 4) Voltage required to operate convenience outlet shall be provided by a factory installed step down transformer.
 - 5) Outlet shall be accessible from outside the unit.
 - b. Non-Powered convenience outlet.
 - 1) Outlet shall be powered from a separate 115/120v power source.
 - 2) A transformer shall not be included.
 - 3) Outlet shall be factory installed and internally mounted with easily accessible 115 v female receptacle.
 - 4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 5) Outlet shall be accessible from outside the unit.
- 8. Propeller Power Exhaust:
 - a. Power exhaust shall be used in conjunction with an integrated economizer.

- b. Horizontal power exhaust shall be mounted in return ductwork.
 - c. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0 100% adjustable set point on the economizer control.
9. Roof Curbs (Vertical):
- a. Full perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.
 - b. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
 - c. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.
10. Low Ambient Kit
- a. Shall contain an integrated low ambient controller to regulate condenser head pressure at low ambient temperatures by varying the amount of airflow through the condenser.
 - b. Shall allow units to operate in cooling mode down to 0° F outdoor ambient.
 - c. Shall be required when mechanical cooling is required at temperatures below 30° F.
11. Phase Monitor
- a. Shall provide protection against phase reversal, phase loss, and phase unbalance.
 - b. Switch shall automatically shut off unit control circuit if any of the above conditions is detected.
 - c. Shall have visual LED indication of operational status.
12. Hinged and tool less access panels (factory installed)
- a. Cabinet panels shall be hinged
 - b. Shall provide easy access with molded composite handles that are permanently attached and recessed into the panel.
 - c. Shall be on major panels of: filter, control box, fan motor, and compressor.

PART 3 - EXECUTION

3.01 FACTORY INSPECTIONS

- A. All work shall be subject to the Owner's inspection and approval at all times, but such approval does not relieve the AHU Manufacturer of responsibility for proper functioning of material and work. Notification shall be given to the AHU Manufacturer by the Owner, in writing, a minimum of 10 business days in advance of the visit.

3.02 FACTORY TESTING

- A. Factory testing shall be conducted at the AHU Manufacturer's facility prior to shipment of the units being tested. The Owner, engineer, and owner designated representative shall witness the tests. The AHU Manufacturer shall notify the Owner, in writing, a minimum of 10 business days in advance of the testing to provide time to coordinate travel arrangements. The AHU Manufacturer shall provide all equipment and trained personnel to conduct each test. Results shall be recorded and provided to the Owner and Engineer to review and approve prior to shipment.
- B. Costs for travel and lodging for the Owner, engineer, and his designated representative shall be covered by the AHU manufacture.
- C. Air Leakage Tests.
 - 1. The AHU Manufacturer shall conduct factory air leakage tests on units. Positive-pressure sections of units shall be tested under positive pressure and negative-pressure sections of units shall be tested under negative pressure. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
- D. Panel Deflection Test.
 - 1. The AHU Manufacturer shall conduct factory panel deflection tests on units. Positive-pressure sections of units shall be tested under positive pressure and negative-pressure sections of units shall be tested under negative pressure. Casing deflection shall not exceed $L/200$ at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.
- E. Factory Sound Test: Acoustical performance shall be provided based on AHRI Standard 260 fan in unit testing. Tests shall be in accordance to AMCA 320 for sound and AMCA 210 for airflow performance. Noise measurements shall be measured at the Inlet, Outlet and Casing Radiated positions.

- F. The AHU Manufacturer shall repair/replace at his own expense any items that fail or are damaged during testing. For any unit that fails testing, the AHU Manufacturer shall retest the unit until all items are in compliance with limits specified herein.
- G. After factory assembly, inspection and testing of units, the AHU Manufacturer shall disassemble each unit (where required) only to the extent necessary for shipment, unless otherwise detailed herein.
- H. The AHU Manufacturer shall legibly mark the parts of work to be erected or field-assembled to enable the Mechanical Contractor to identify the various parts and erect the work without delay.

3.03 SHIPPING

- A. Paper copies of the IOM shall also be shipped with each AHU.
- B. The AHU Manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU Manufacturer shall place them in containers.
- C. To protect equipment during shipment and delivery, all outdoor units shall be completely shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment.
- D. After loading the equipment for shipment, the AHU Manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.04 ON-SITE STORAGE

- A. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.05 LEVELING

- A. The Mechanical Contractor shall laser level all unit mounting surfaces, including housekeeping pads, roof curbs, and/or structural steel prior to rigging and installation of the AHU units. Should the AHU units be installed on an unlevel surface, the Mechanical Contractor shall rework the installation

at his/her own expense and to the satisfaction of the Owner and Engineer and to ensure proper installation.

3.06 FIELD EXAMINATION

- A. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.
- B. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.

3.07 INSTALLATION

- A. The Mechanical Contractor shall be responsible to coordinate ALL of his installation requirements with the Owner and the Owner's selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or -welded joints, and all other installation and assembly requirements.
- B. The AHU Manufacturer shall provide all screws and gaskets for joining of sections in the field.
- C. The AHU Manufacturer shall provide a factory-authorized service representative employed by the AHU Manufacturer to conduct a pre-installation inspection, provide rigging oversight, and supervise the AHU installation work provided by the Mechanical Contractor. The Mechanical Contractor shall obtain site readiness approval from the AHU Manufacturer prior to proceeding with rigging and installation of AHU units. The Mechanical Contractor shall repair or replace at his/her expense and to the satisfaction of the Owner and Engineer any misalignment or damage that occurs to the AHU units due to the Mechanical Contractor not following the guidance of the factory-authorized service representative employed by the AHU Manufacturer.
- D. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU Manufacturer's final inspection and start-up:
 - 1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
 - 2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.

3. All water and steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.
4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.
5. All power wiring, including motor starters and disconnects, serving the unit has been completed.
6. All automatic temperature and safety controls have been completed.
7. All dampers are fully operational.
8. All shipping materials have been removed.
9. All (clean) filter media has been installed in the units.

3.08 FINAL INSPECTION AND START-UP SERVICE

- A. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the factory-authorized service representative employed by the AHU Manufacturer shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.
- B. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start-up.
- C. Under the guidance and supervision of the factory-authorized service representative employed by the AHU Manufacturer the Mechanical Contractor, shall perform the following tests and services and submit a report outlining the results:
 1. Record date, time, and person(s) performing service.
 2. Lubricate all moving parts.
 3. Check all motor and starter power lugs and tighten as required.
 4. Verify all electrical power connections.
 5. Conduct a start-up inspection per the AHU Manufacturer's recommendations.
 6. Record fan motor voltage and amperage readings.

7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
8. Check fan for excessive vibration.
9. Check V-belt drive or coupling for proper alignment.
10. Check V-belt drive for proper tension. Tighten the belts in accordance with the AHU Manufacturer's directions. Check belt tension during the second and seventh day's operation and re-adjust belts, as may be required, to maintain proper tension as directed by the AHU Manufacturer.
11. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
12. Disengage all shipping fasteners on vibration isolation equipment.
13. Check safety guards to ensure they are properly secured.
14. Secure all access doors to the fan, the unit and the ductwork.
15. Switch electrical supply "on" and allow fan to reach full speed.
16. Physically check each fan at start-up and shut-down to ensure no abnormal or problem conditions exist.
17. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.
18. Check all control sequences.

3.09 NOISE AND VIBRATION

- A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.
- B. Corrective Measures: If specified noise and/or vibration levels are exceeded, provide necessary changes to reduce noise and/or vibration levels to within specified levels.

3.10 FIELD TESTS AND INSPECTION

- A. General: Perform field inspections, field tests, and trial operations as specified in Section 23 0500: Common Work Results for HVAC. Provide labor, equipment and incidentals required for testing. The Project Inspector will

witness field tests and trial operations as specified in Section 23 0500: Common Work Results for HVAC.

- B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at the place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.
- C. Start-Up and Operational Test: System shall be started up and initially operated with components operating. During this test, filters shall be periodically cleaned until no further accumulation of foreign material occurs. Adjust safety and automatic control instruments as required to provide proper operation and control sequence. Refer to Section 23 0500: Common Work Results for HVAC.
- D. Extent of Field Tests: After installation and before completion, Work of this Section shall be subjected to required field tests, including those specified here and in Section 23 0500: Common Work Results for HVAC.
- E. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 0500: Common Work Results for HVAC.

3.11 PROTECTION

- A. Protect the Work of this Section until Substantial Completion.

3.12 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION 23 70 00

PART 1 - GENERAL

1.1. SUMMARY

- A. Section includes: Air conditioning and air handling equipment including but not limited to:

1. Split System Custom Package Air Conditioning Units

1.2. RELATED DOCUMENTS:

- A. Drawings, Schedules, and General Provisions of the Contract apply to work of this section.

- B. Related Requirements:

1. Division 01: General Requirements
2. Section 07 60 00: Flashing and Sheet Metal
3. Section 22 10 00: Plumbing
4. Section 23 05 00: Common Work results for HVAC
5. Section 23 05 13: Basic HVAC Materials and Methods
6. Section 23 05 48: HVAC Sound, Vibration, and Seismic Control
7. Section 23 09 00: HVAC Instrumentation and Controls
8. Section 23 09 23: Environmental Control and Energy Management System
9. Section 23 30 00: Air Distribution

- C. Material standards shall be as specified or detailed hereinafter and as follows:

1. AMCA Publication 99 – Standards Handbook
2. AMCA Publication 311 – Certified Ratings Programme - Product Rating Manual For Fan Sound Performance.
3. AMCA Standard 300 – Reverberant Method for Sound Testing of Fans.
4. AMCA Standard 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
5. AMCA Standard 500-D – Laboratory Methods of Testing Dampers for Rating.
6. AMCA Standard 500-L – Laboratory Methods of Testing Louvers for Rating.

7. ANSI/ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings.
8. ANSI/ABMA 11 – Load Ratings and Fatigue Life for Roller Bearings.
9. ANSI/AMCA Standard 204 – Balance Quality and Vibration Levels for Fans.
10. ANSI/AMCA Standard 210 – Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
11. ANSI/AHRI Standard 1060 – Rating Air-to-Air Energy Recovery Ventilation Equipment.
12. ANSI/ASHRAE 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
13. ANSI/NEMA MG 1 – Motors and Generators.
14. AHRI Standard 260 – Sound Rating of Ducted Air Moving and Conditioning Equipment.
15. AHRI Standard 410 – Forced-Circulation Air-Cooling and Air-Heating Coils.
16. ASHRAE 52.1 – Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
17. ASHRAE 84 – Method of Testing Air-to-air Heat Exchangers.
18. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
19. ASTM E477 – Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.
20. NFPA 70 – National Electrical Code®.
21. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilation Systems.
22. UL 555S – Standard for Safety Smoke Dampers.
23. UL 900 – Standard for Safety Air Filter Units.
24. UL 1812 – Standard for Safety Ducted Heat Recovery Ventilators.
25. UL 1995 – Standard for Safety Heating and Cooling Equipment.

1.2 ABBREVIATIONS

1. ABMA – American Bearing Manufacturers Association.
2. AC – Alternating current.
3. AF – Air foil.

4. AHU – Air handling unit or fan coil unit.
5. AI – Analog input.
6. AMCA – Air Movement and Control Association International, Inc.
7. ANSI – American National Standards Institute.
8. AO – Analog output.
9. AHRI – Air-Conditioning, Heating, and Refrigeration Institute.
10. ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers.
11. ASTM – American Society for Testing and Materials.
12. BAS – Building automation system.
13. BC – Backward curved.
14. BI – Binary input.
15. BO – Binary output.
16. cfm – Cubic feet per minute.
17. dB – Decibels.
18. DDC – Direct digital controls.
19. DOP – Dioctyl phthalate aerosol.
20. DWDI – Double width, double inlet.
21. EATR – Exhaust air transfer rate.
22. EMT – Electrical metal tubing.
23. EPAct – Energy Policy Act.
24. ETL – Electrical Testing Laboratories.
25. FC – Forward curved.
26. FLA – Full load amps.
27. FM – Factory Mutual.
28. FMC – Flexible metal conduit
29. FOB – Freight on board.

- 30. fpm – Feet per minute.
- 31. GFCI – Ground fault circuit interrupter.
- 32. HEPA – High efficiency particulate air filter.
- 33. Hp – Horsepower.
- 34. Hz – Hertz.
- 35. IEC – International Electrotechnical Commission.
- 36. IFB - Integral face and bypass.
- 37. IOM – Installation, operation and maintenance manual.
- 38. IRI – Industrial Risk Insurers.
- 39. ISO – International Organization for Standardization.
- 40. kW – Kilowatts.
- 41. mA – Milliamps.
- 42. MCA – Minimum circuit ampacity.
- 43. MERV – Minimum efficiency report value.
- 44. MOP – Maximum overcurrent protection.
- 45. MPT – Male pipe thread.
- 46. NEC – National Electric Code.
- 47. NEMA – National Electrical Manufacturers Association.
- 48. NFPA – National Fire Protection Association.
- 49. NIST – National Institute of Standards and Technology.
- 50. OD – Outside diameter.
- 51. ODP – Open drip proof.
- 52. OSHA – Occupational Safety and Health Administration.
- 53. ppm – Parts per million.
- 54. psf – Pounds per square foot.
- 55. psig – Pounds per square in gage.

- 56. PWM – Pulse-width modulated.
- 57. RAM – Random access memory.
- 58. rpm – Revolutions per minute.
- 59. RTD – Resistive temperature detector.
- 60. SMACNA – Sheet Metal and Air-Conditioning Contractors' National Association.
- 61. SWSI – Single width, single inlet.
- 62. TEFC – Totally enclosed, fan cooled.
- 63. UL – Underwriters Laboratory.
- 64. V – Volts.
- 65. VAC – Volts alternating current.
- 66. VDC – Volts direct current.
- 67. VFD – Variable frequency drive.
- 68. W – Watts.
- 69. w.g. – Water gage.
- 70. °F – Degrees Fahrenheit.
- 71. ' – Feet.
- 72. " – Inches.

1.3 DEFINITIONS

- A. Hereinafter, a Class "A" thermal break shall be defined as a thermal break that ensures no member on the exterior of the unit, including fasteners, has through metal contact with any member on the interior of the unit, including fasteners.
- B. Hereinafter, wall assemblies shall include all unit wall panels around the air tunnel perimeter, all channels exposed to both the interior and exterior of the unit, and all removable wall access panels.
- C. Hereinafter, door assemblies shall include interior and exterior unit door panels, door frames, and door channels.
- D. Hereinafter, roof assemblies shall include exterior unit roof panels, interior unit ceiling panels, and all roof channels exposed to both the interior and exterior of the unit.

1.4 SCOPE OF WORK

- A. The AHU Manufacturer's work shall include, but is not necessarily limited to the following:
1. Furnish a complete set of submittals as described hereinafter.
 2. Provide AHUs fully factory assembled with the exception of unit splits as required for shipping or installation requirements as determined by the installing contractor. As shipped from the AHU Manufacturer, AHUs shall meet the performance requirements shown on the equipment schedule. Units shall be for outdoor application and shall have all components and options as indicated on the schedule or drawings. Furthermore, units shall be constructed as detailed hereinafter. Field-provide components and options shall be unacceptable unless otherwise noted.
 3. Provide all labor, materials, and equipment necessary for the complete engineering, production, factory assembly, factory testing, packaging, and delivery of the custom AHUs and their related equipment. Controls contractor to provide control end devices and unit controllers, for factory mounting and wiring.
 4. Permit the Owner and Engineer to inspect as herein described and to witness performance tests to ensure good product quality and compliance with these specifications.
 5. Factory test all AHUs as detailed herein and on the schedule.
 6. Provide a factory-authorized service representative employed by the AHU Manufacturer to supervise installation and start-up of the units as herein described.
 7. Provide Owner's Manual, complete operating instructions.
- B. Mechanical Contractor whose work will generally include the following:
1. Receive and unload the custom AHUs. Inspect the unit sections as they arrive on the job site. Notify the trucking company, AHU Manufacturer, and Owner of any shipping damage immediately.
 2. Coordinate all work associated with the AHU installation. Schedule with the AHU Manufacturer for a factory-authorized service person employed by the AHU Manufacturer to supervise unit installation. Clear area where unit is to be set of any construction materials or debris. Ensure equipment curbs or support platforms are level prior to setting the units. Hoist and set units in their proper position. Use spreader bars to hoist the unit (sections) to avoid damaging units. If units ship in multiple sections, provide all labor and equipment for placing and field joining sections.
 3. Provide all final chilled water, hot water, glycol water, steam, and drain piping connections. Release the fan spring isolator shipping restraints.

CUSTOM AIR HANDLING OUTDOOR EQUIPMENT

4. Remove all foreign objects and thoroughly clean the interior and exterior surfaces of the units with a mild detergent (soap and water). Do not use any abrasives or solvents without first consulting the AHU Manufacturer.
5. Install filter media in filter frames. Operating units without filter media is strictly prohibited.
6. Perform unit start up as detailed herein under the guidance and supervision of a factory-authorized service person employed by the AHU Manufacturer.

C. Electrical Contractor work will generally include the following:

1. Provide wiring between Owner's normal/emergency power source and the units.
2. Perform unit start up as detailed herein under the guidance and supervision of a factory-authorized service person employed by the AHU Manufacturer.

1.5. BID REQUIREMENTS

- A. The AHUs shall meet the performance criteria as indicated on the schedule and drawings.
- B. Base Bid AHU Manufacturers: Alliance (Basis of Design), PACE, Solutions.
- C. Naming of manufacturers does not imply that their standard construction is acceptable, nor does it imply that their products are automatically approved. A manufacturer who is not the basis of design is required, 14-days prior to bid, to submit to the mechanical engineer, proposed equipment, along with a comparison letter addressing each item in the specification and stating compliance with the specifications. This proposed submittal must be approved in writing by the mechanical engineer a minimum of 3- days prior to bid date. Approval will be at the discretion of the mechanical engineer. There shall be no exceptions to this requirement, and submittals of manufacturers who have not obtained written approval prior to bid will be rejected without review, and returned. The Mechanical Contractor shall be responsible for all additional costs incurred by the Engineer during the submittal and re-submittal phases for any contract awarded to a manufacturer not on the approved list.
- D. All AHU Manufacturer's that are not basis of design shall deliver selection data to the bid examiner. Selection shall include the following:
 1. Fan performance curves, coil performance, and unit discharge, inlet, and certified radiated sound power levels.
 2. Unit casing thermal performance at design supply air temperature graphed on a psychometric chart.
 3. A list of all exceptions and clarifications the AHU Manufacturer is taking to the specifications.

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- E. To ensure injected closed-cell foam is properly engineered for rigidity and thermal performance, is amply applied to fill all cavities within each assembly, and is correctly cured to yield strong adhesion to casing members, the AHU Manufacturer shall have experience using injected closed-cell foam as an insulation in AHUs for no less than 5 years.
- F. Mechanical contractor shall carry full responsibility for any AH equipment that don't fit or don't meet the acoustical requirements of each designated area, at its own expense acoustical traps or leak test shall be done for any field modification.
- G. Contractor shall bare additional cost for new structural & acoustical calculations by using another listed brand.

1.6 SUBMITTALS

- A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Owner or Owner's approved representative.
- B. AHU Manufacturer shall provide the following information with each shop drawing/product data submission:
 - 1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, support locations, and weights. Drawings shall also indicate all electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations. Each component of the unit shall be identified and shall include physical dimensions and material of construction.
 - 2. Panel-to-panel joint and corner details and panel-to-roof details, all showing Class "A" thermal breaks.
 - 3. All performance data, including capacities and airside and waterside pressure drops, for components. AMCA-certified fan curves shall be provided with specified operating point clearly plotted. AMCA-certified sound power level data for fan inlet and outlet at fan rated capacity shall be provided. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, and 4000 Hz based on AHRI 260 fan in unit testing.
 - 4. Brand and model of fans, fan motors, coils, air filters, dampers, outside and return air measuring stations, and unit DDC controllers being furnished.
- C. The AHU Manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.

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- D. The AHU Manufacturer shall list any exceptions to the specification.

1.7 WARRANTY AND SERVICE

- A. AHU Manufacturer shall provide a parts & labor warranty extending 12 months from start-up or 18 months from shipment, whichever comes first.
- B. The AHU Manufacturer shall have a service department located within 50 miles of the job site, and 4 hour respond 24/7.
- C. Compressors shall be provided with manufacturer's 5-year warranty
- D. Manufacturer shall warrant parts, except heat exchangers, for a period of 5-years.
- E. Heat Exchangers shall be provided with manufacturer's

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Capacities of air conditioning equipment indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual project site environmental conditions.

2.2 MANUFACTURERS

- A. Basis of Design: Alliance

2.3 AGENCY LISTING

- A. AHUs shall be agency listed to UL 1995 by UL or ETL.

2.4 UNIT NAMEPLATES AND LABELS

- A. Metal nameplates shall be provided on the units. All information contained on the nameplate shall be etched or burned into the surface to prevent fading. Information shall include:
 - 1. Job name, sales order number, unit tagging, and service model number.
 - 2. MCA, MOP, and maximum fuse/HACR circuit breaker size.
 - 3. Voltage, frequency, phase, Hp, FLA, and inverter input current for all motors.
- B. Labels for AHRI Standard 410 and the listing agency, either UL or ETL, shall be provided on the units.
- C. Labels shall be provided on the units for unit rigging and coil piping and connection instructions. Labels shall be provided on fans indicating direction of

rotation. Warning labels shall be provided on appropriate components indicating hazardous voltage. For each section which must be assembled to another, matching steel identification tags shall be welded at each mating joint to ensure correct assembly order.

2.5 UNIT CONSTRUCTION

A. Casing Performance

1. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
2. Casing deflection shall not exceed $L/200$ at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.
3. Under scheduled supply air temperature and design conditions on the exterior of the unit of 79°F dry bulb and 68°F wet bulb, condensation shall not form on the casing exterior. The AHU Manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU Manufacturer shall provide, in writing, a guarantee against condensation forming on the unit exterior under the scheduled supply air temperature and design conditions on the exterior of the unit of 79°F dry bulb and 68°F wet bulb. The guarantee shall note that the AHU Manufacturer will cover all expenses associated with modifying units in the field should external condensate form on them. Copies of the guarantee shall be provided to the Engineer and the Owner.

4. IBC Seismic Certification

- a. All AHUs shall be certified for seismic applications in accordance with the following International Building Code (IBC) releases: IBC 2000, 2003, 2006, 2009.
- b. Seismic qualification testing and structural analysis shall be conducted in accordance with and strict adherence to the standards set forth within ASCE 7 by an independent approval agency with a complete list of certified models, options, and installation methods provided in an approved detailed report. The AHUs shall be approved for seismic applications when properly installed and used as intended. The basis of the certification shall be obtained through a combination of testing of the active and energized components per AC156, and analysis of the main force resisting members of the unit. Additional calculations shall be conducted to ensure components, accessories, and options remained intact and attached to the unit under seismic load conditions.

- c. The certification shall be based on a maximum Design Structural Response

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Acceleration at Short Period (Sds) value of 1.85 g's for IBC 2006 and 2009, and 1.93 g's for IBC 2000 and 2003. This is obtained from the Maximum Considered Earthquake Short Period Spectral Response Acceleration, Ss, of 2.78 g's or 2.90 g's as determined by the ASCE 7 seismic maps for Soil Site Class B with 5 percent damping. When the site soil properties or final equipment installation location are not known, the soil site coefficient, Fa, defaults to the Soil Site Class D coefficient. Occupancy Category IV and Seismic Design Category C shall be covered under this certification, limited by the Sds value stated above. A seismic importance factor, Ip, of 1.5 shall apply to the certification to include essential facility requirements and life safety applications for post event functionality.

- d. For IBC 2000 and 2003, $FP/WP = 0.4 \times 2/3(S_s=2.90) \times (F_A=1) \times (I_P=1.5) \times (\alpha_P/RP=0.40) \times (1+2(z/h=1.0)) = 1.39 \text{ g's}$. For IBC 2006 and 2009 $FP/WP = 0.4 \times 2/3(S_s=2.78) \times (F_A=1) \times (I_P=1.5) \times (\alpha_P/RP=0.42) \times (1+2(z/h=1.0)) = 1.39 \text{ g's}$
- e. Structural floors, housekeeping pads, supporting curbs, and supporting steel must be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads. Installation details such as special inspection, attachment to a curb, or attachment to a non-building structure must be outlined and approved by the Engineer of Record for the project or building. The installing contractor shall be responsible for the proper installation of the equipment and must observe the seismic installation requirements set forth by the Engineer of Record.

B. Bases & Floors

1. Base shall be construction from welded structural aluminum channels around the perimeter and welded structural aluminum cross members. Formed channels are not acceptable. The structural aluminum base shall be shot blasted, fully welded and then painted. The maximum cross-member spacing shall be 24" on center with members located adequately to support fan, coils, and other large components. The height of each base channel shall be no less than the height indicated in the drawings. Each shipping section shall be provided with removable lifting lugs. Structural framework shall fully support the unit casing and all components during installation such that no section deflects more than L/1000 during rigging of that section, where L is defined as the distance between lifting lugs.
2. AHU Floor shall be constructed from 0.063" aluminum safety tread plate surface. The floor surface shall be continuously welded with 2" turned up lip around the base perimeter and all floor penetrations. Caulk is not an acceptable sealing method for the floor. Floor drains shall be located in the floor to drain all sections. Floor drains shall be a minimum of 1.5" in diameter and shall be piped to the exterior of the unit base. Floor deflection shall not exceed L/200 under a point load of 200 pounds, where L is defined as the floor span. A 0.025" thick aluminum liner shall be attached to the underside of

the unit base and cross members, ensuring that the floor insulation is completely encapsulated.

3. Insulation that meets a minimum R-value of 12.5 shall be minimum 2" thick and shall be provided underneath the entire unit floor. Insulation shall be closed-cell foam to prevent wicking of moisture. Insulation shall completely fill the panel cavity in all directions so that no voids exist. Base assemblies shall comply with NFPA 90 A.
4. Safety grates that provide a walking surface shall be provided across all bottom air openings. Safety grates shall support a minimum 300-pound load. Safety grates shall be made of Type IWA welded rod with a cross flow pattern of 1.1875" x 4". Grating shall be aluminum construction for units with aluminum floors. Safety grates shall be removable to ensure adequate access to the ductwork below.

C. Walls

1. Wall assemblies shall be double-wall construction with 0.063" thick textured aluminum solid exterior and 0.025" thick smooth aluminum interior. The entire unit shall have a solid wall aluminum liner on the interior, except for the fan section, which shall have perforated wall liner. All spaces and joints of wall assemblies shall be completely sealed. Wall shall meet the casing deflection limits contained herein. Bolting of wall panels shall be 304 stainless on maximum 8" centers. Sheet metal or Tek fasteners are not acceptable for sealing pressure containing panels.
2. A Class "A" thermal break shall be provided throughout the entire wall assembly.
3. Insulation that meets a minimum R-value of 12.5 shall be minimum 2" thick with minimum 1.5 pound/cu.ft density, and shall be provided throughout all unit wall assemblies. Insulation shall be fiberglass and completely wrapped with long-strand fiberglass cloth to limit the entrainment of moisture into the insulation. The long-strand fiberglass cloth shall also incorporate an anti-microbial coating to suppress microbial growth. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Wall assemblies shall comply with NFPA 90 A.
4. Removable wall access panels shall be provided in coil and fan sections for service removal of components. A Class "A" thermal break shall be provided throughout all removal wall access panels.
5. Fan sections shall include 0.025" perforated aluminum interior sheet metal liners in fan blast area. Insulation in sections lined with perforated sheets shall be faced with neoprene.
6. Cooling coil and direct evaporative sections shall include 20 gauge 304 stainless steel liner.

7. All floor openings shall have 1" minimum flange up around entire perimeter.

D. Access Doors

1. Access doors shall be provided throughout units as indicated on the schedules and drawings. Access doors shall be double wall construction. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels, respectively.
2. A Class "A" thermal break shall be provided on all door assemblies downstream of the cooling coil.
3. Insulation that meets a minimum R-value of 12.5 shall be provided throughout all door assemblies. Insulation shall be injected foam. Foam shall be closed cell to prevent wicking of moisture. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Door assemblies shall comply with NFPA 90 A.
4. All doors shall be a minimum of 60" high if sufficient height is available, or the maximum height allowed by the unit height. All doors shall open against pressure to ensure an airtight seal and to prevent a safety hazard.
5. Door hinges shall be die-cast zinc with provision for adjustment without the use of shims or special tools. Door latches and handles are to be bolted to the unit and made with corrosion resistant materials. Bolts, nuts and shafts for door latches, handles and hinges shall be made of zinc plated steel. Door latch and pawl assembly shall be industrial quality and corrosion resistant with a handle on both the inside and outside of door. Latching mechanism shall be of conical roller design. Latch and pawl assembly shall be bolted together without the use of set screws.

All doors to fan sections shall be provided with latches which require a tool to open.

6. Windows shall be provided on doors in fan sections. Windows shall be mounted in a metal frame and shall be a minimum of 8" x 8", with wire-reinforced safety glass. For any instance where a window cannot fit in a door, a narrower window 8" tall may be provided. Windows in doors with a thermal break shall be thermal, double-pane type.

E. Roofs

1. Roof assemblies shall be double wall construction. Exterior roof panels and interior ceiling panels shall be of the same construction as the exterior and interior wall panels, respectively. Sections in units with perforated interior wall liners shall have perforated interior ceiling liners. For perforated liners, a triple-wall panel shall be provided. This triple-wall panel shall be constructed such that two layers of the panel are solid, with the afore-mentioned class of thermal break between them to isolate the supply air from contact with the outside panel. The third, inner liner shall be perforated. All spaces and joints of roof assemblies shall be completely sealed. In addition to meeting the casing

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deflection limits contained herein, roof deflection shall not exceed $L/200$ under a point load of 200 pounds, where L is defined as the roof panel span.

2. Outdoor unit roofs shall incorporate a standing seam on the exterior to ensure a rigid roof construction. Outdoor roofs shall be sloped, not less than 1/4" per foot for water drainage. Where outdoor units are shipped in multiple sections, provide standing-seam joiners at each split with adhesive, hardware, and cover strips for field joining by the installing contractor. On outdoor units, rain gutters shall be provided over all doors to direct rain away from the door assembly.

F. Shipping Splits

1. Shipping splits shall be provided as indicated on the schedule and drawings. Heavy-gage gussets shall be provided in the corners of each split on the unit interior to minimize the opportunity for racking of the section during shipping and rigging. Structural members shall be provided at the base of the unit exterior to enable pull together of each shipping split.

2.6 UNIT COMPONENTS

A. Dampers

1. Approved manufacturers: TAMCO, Ruskin.
2. Damper Sections: Dampers shall be low leakage type with airfoil blade design. All dampers shall carry the AMCA Standard 500 certification label. Air leakage through a 48" x 48" damper shall not exceed 10 CFM/ft².

Blade gasket shall be extruded EPDM elastomer secured in an integral slot within the aluminum extrusion. Frame seals shall be extruded TPE thermoplastic. Overlapping blade design shall compress seals to ensure tight seal on closure.

Damper frame shall be extruded aluminum with a thickness of not less than .080" and a depth of 4". Pivot rods shall be 7/16" hexagon extruded aluminum interlocking into blade section.

Bearings shall be double seal with an inner bearing fixed to the rod within a polycarbonate outer bearing inserted into the frame so that the outer bearing cannot rotate. Bearings shall be designed so that there is no metal to metal contact.

Linkage hardware shall be installed outside of the frame and constructed of corrosion resistant aluminum and zinc plated steel.

B. Air Filters

1. Approved manufacturers: Flanders, American Air filters, and Farr.
2. All filters shall be 12" x 24", 24" x 24", 24" x 20", or 20" x 20" nominal sizes to minimize the number of sizes required to be stocked by the Owner. Filters of other nominal sizes will not be acceptable.
3. Prefilters shall be minimum 2" thick, pleated disposable type. Prefilters shall be UL Class 2 when tested in accordance with UL Standard 900
4. Medium Efficiency mini Pleat Media Filters or rigid box filters
 - a. Pleated media filters 4" or 12" deep shall be provided as indicated on the schedule and drawings. The MERV 13 rating shall tested in accordance with ANSI/ASHRAE 52.2. Filter media shall be of non-woven fibers with metal grid support. Filters shall be provided with an anti-microbial coating. One set of extra filters shall be provided with each unit.
 - b. Filters shall be UL Class 2 when tested in accordance with UL Standard 900.
5. Filters shall be provided with front-loading frames. Filter holding frames shall be constructed of stainless steel and equipped with foam gaskets to seal filters against filter frames. Frame seams shall be sealed to eliminate air bypass. Front-loading frames shall be equipped with filter fasteners of the same material as the filter frame. Filter fasteners shall be capable of being installed without the use of special tools, bolts or nuts. Filter holding frames shall be of a universal type to accommodate standard filters of the same nominal size as well as appropriate fasteners. Filter access shall be as indicated on the schedule and drawings.
6. A Digihelic differential pressure gauge shall be provided factory installed for measuring the

pressure drop across each filter bank. The gauge shall be a diaphragm-actuated dial type, 4³/₄" O.D., with white dial, black figures and graduations and pointer zero adjustment.

C. Cooling and Heating Coils

1. Approved manufacturers: RAE, American Coil, Heatcraft, Luvata.
2. Coil performance shall be provided as indicated on the schedule and drawings. Coil capacities, pressure drops and selection procedures shall be certified to AHRI Standard 410.
3. Coils shall have same-end header connections. Connection locations (hanging) shall be as indicated on the drawings. Grommets shall be provided

at coil casing penetrations around the coil piping. Grommets shall be designed to seal the opening under positive and negative pressure.

4. DX Coils

- a. DX coil performance, circuiting, hot gas bypass line and piping layout shall be selected in accordance with the condenser unit requirements.
- b. Refrigerant shall be 410A or other Enviro-safe types.
- c. DX coils shall be provided as indicated on the schedule and drawings.
- d. DX coils shall have 0.006" thick copper fins. Fins shall be mechanically bonded to 3/8" OD seamless copper tubes with 0.020" thick walls. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion. All returns bends shall have a minimum wall thickness of 0.025" and shall be brazed and individually removable. Hairpin return bends are not allowed. Coils shall be circuitied for counter-flow heat transfer. Coil casings shall be constructed of stainless steel.

5. Primary Drain Pans

- a. Primary condensate drain pans shall be provided in cooling coil sections as detailed in the drawings. Drain pans in cooling coil sections shall be 304 stainless steel. Primary drain pans shall extend under each entire coil bank, including headers and return bends. Primary drain pans shall extend downstream of the coil bank for a minimum distance as indicated in the drawings. Primary drain pans shall be sloped a minimum of 1/8" per foot, shall be a minimum of 2" deep, and shall be double-sloped (sloped in 2 planes) to positively drain. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum of 1-1/2" beyond the base to ensure adequate room for field piping of condensate drain traps. Drain connection locations (handing) shall be as indicated on the schedule and drawings. Any coil support member located inside a primary drain pan shall be of the same material as the drain pan. Coil drain pans shall be supported by structural aluminum members under the floor.

6. Intermediate Drain Pans

- a. For cooling coil sections requiring stacked coils, sloped intermediate drain pans constructed of stainless steel shall be provided under each upper-level coil in the coil bank and shall extend under the entire coil, including headers and return bends. Intermediate drain pans shall extend downstream of the leaving face of the coil bank for a minimum of 4". Non-corrosive pipe with a minimum diameter of 1" shall be connected to each end of all intermediate drain pans, and shall be piped to the primary drain pan of the coil section. Any coil support member located inside an intermediate drain pan shall be of the same material as the drain pan.

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7. Steril-Aire UV Lights downstream of the coil mounted on Stainless steel racks and interlocked with the door for safety. Minimum intensity shall be 1225 $\mu\text{W}/\text{cm}^2$. Emitters and fixtures are to be installed in sufficient quantity and in such an arrangement so as to provide an equal distribution of UVC energy on coil and drain pan. Unit shall be high output, HVAC-type, germicidal UVC light source, factory assembled and tested. Component shall include a housing, reflector, high efficiency electronic power source, emitter sockets and tube, all constructed to withstand HVAC environments. Emitter tube shall be of the high output, hot cathode, T5 diameter, and medium bi-fin type. Intensity shall remain constant across a temperature range of 41-132°F.

D. Fans

1. Approved manufacturers: Pen Barry, Twin Cities, or equal.
2. Fan shall be SWSI Direct drive arrangement 4 as indicated on the schedule, minimum Class 2. Wheels are high efficiency, non-overloading type backward inclined airfoil blade design. Wheels contain 9 blades and are constructed from extruded aluminum. Fans shall be designed with reinforced steel inlet plate, structural steel frame, shaft, and bearings. Each fan assembly, including sheaves and belts, shall be trim balanced at the factory in accordance with ANSI 204-96 to Balance Quality Grade G6.3. Fans shall be rated in accordance with AMCA Standard 210 for air performance and AMCA 300 for sound. All fans shall carry the AMCA certification label
3. Fans shall be isolated with manual blank-offs to prevent backflow in the event of individual fan failure.
4. Nameplate motor horsepower for all fans, including dual fans, shall be at least 10% greater than design brake horsepower of each fan.
 - e. Motors shall be premium efficiency, NEMA Design B, TEFC, with Class B insulation. Minimum service factor shall be 1.15 and motors shall not be selected to operate in the service factor. Each fan/ fan array shall be provided with a VFD, as well as a redundant VFD with automatic switchover.
 - f. Aegis SGR motor bearing protection ring kit provided for each motor that is connected to a VFD. Protects motors from catastrophic failure and channels harmful VFD induced shaft currents to ground.
5. Fan Air Flow Measuring Stations: The flow measuring station shall consist of total pressure taps located in the inlet cone of each fan, with static pressure tap located near fan inlet panel. Any flow measuring device which creates an obstruction in the fan inlet is not acceptable. Provide a Dwyer magnehelic pressure gauge with CFM scale which indicates the fan volume. Flow gauges shall be calibrated to match the flow coefficient of the fan inlet cone provided.

Provide a DH3 Digihelic differential pressure switch for each fan. The transmitter shall be produce a 4 – 20 mA or 0 – 5 Vdc signal linear and

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- scaled to air volume or velocity. The transmitter shall be capable of withstanding over pressurization up to 200 times greater than span and shall be factory calibrated.
6. Fan Assembly Isolation Base: Fan and motor shall be mounted on an integral fully welded structural base. Base shall be free floating at all four corners on spring type isolators with earthquake restraints rated for Seismic Zone 4 requirements. Isolator spring deflection shall be 2" minimum or as indicated on specifications. Isolator supports shall be attached to base structural members, and welding to the floor skin is not acceptable.
- E. Service Lighting and Convenient Outlet: Guarded vapor proof marine lights factory wired to a single weatherproof switch located on exterior of cabinet. Provide weatherproof, 15 amps, GFCI receptacle near the light switch wired to the lighting circuit.
- F. Outside air intake
1. Provide air flow measuring station for outside air intake. Provide transmitter with digital readout and analog output for BMS.
 2. Either extruded aluminum louvers or weather hoods shall be used at outside air intake location. Louvers shall be stationary, wind driven rain resistant drainable type with built in downspouts and furnished with bird screen. Blades shall be vertical and housed inside an aluminum frame mounted to the unit exterior. Weather hoods shall be fabricated from aluminum and painted the same finish as unit exterior. Weather hood openings are lined with 1/2" galvanized mesh bird screen. Weather hoods are designed for 750 fpm maximum face velocity.
- H. Electrical Wiring: Provide single point power connection with a non-fused manual disconnect of the proper amp rating in the control cabinet for each air handling unit. Provide factory power wiring from VFD's to the fan motors. Provide redundant VFD's with automatic switchover, factory mounted and wired.
- Provide copper wires, bus bars, and fittings throughout. Identify power supply terminals with permanent markers. The maximum temperature of terminals shall not exceed 167 degrees F when the equipment is tested in accordance with its rating. All wiring (460V, 120V and 24V) shall be in conduit.
- Separate terminal shall be provided for 120V power connection for service lights and convenience outlets. A separate 120V power source shall be coordinated with Division 26 –Electrical.
- Separate terminal shall be provided for 120V power connection for controls. A separate 120V power source shall be coordinated with Division 26 –Electrical.
- I. Unit mounted controls shall be installed by controls contractor. All end devices and control boards shall be provided by the temperature controls contractor. All wiring must be in conduit.
- J. Paint Finish: Exterior wall and roof panels shall be coated with polyurethane to a

minimum dry thickness of 3 mils. Finish shall have no blistering or rusting on unscribed areas after 10,000 hours in accordance with ASTM B-117 salt fog test. Entire structural base shall be primer painted with industrial grade epoxy primer for total thickness of 4 mils minimum.

K. Low Ambient Operation: Head pressure control shall be provided for operation at outside air temperature below 45°F:

2.7 BUILDING MANAGEMENT SYSTEM DIAGNOSTIC POINTS

A. Diagnostic Points

1. Leaving Supply Air Temperature
2. Mixed Return Air Temperature
3. Outside Air Temperature
4. Space Temperature
5. Space CO2 Level (interlock w/ Demand Control Ventilation)
6. Fan Status
7. HP Compressor Status
8. Filter Status

B. Safeties

1. High Condensing Temperature protection.
2. Compressor motor current and temperature overload protection.
3. High Pressure relief.
4. Outdoor fan failure protection.

2.7 PARTS AVAILABILITY

A. Submit proof in writing that majority (minimum 80 percent) of replacements parts are commonly available and not proprietary. Also, submit proof in writing that a local parts sales and service facility exists, where replacement parts will be warehoused in quantity. Guarantee timely availability for parts that are proprietary.

PART 3 - EXECUTION

3.1 FACTORY INSPECTIONS

- A. All work shall be subject to the Owner's inspection and approval at all times, but such approval does not relieve the AHU Manufacturer of responsibility for proper functioning of material and work. Notification shall be given to the AHU

Manufacturer by the Owner, in writing, a minimum of 10 business days in advance of the visit.

3.2 FACTORY TESTING

- A. Factory testing shall be conducted at the AHU Manufacturer's facility prior to shipment of the units being tested. The Owner, engineer, and owner designated representative shall witness the tests. The AHU Manufacturer shall notify the Owner, in writing, a minimum of 10 business days in advance of the testing to provide time to coordinate travel arrangements. The AHU Manufacturer shall provide all equipment and trained personnel to conduct each test. Results shall be recorded and provided to the Owner and Engineer to review and approve prior to shipment.
- B. Costs for travel and lodging for the Owner, engineer, and his designated representative shall be covered by the AHU manufacture.
- C. Air Leakage Tests.
 - 1. The AHU Manufacturer shall conduct factory air leakage tests on units. Positive-pressure sections of units shall be tested under positive pressure and negative-pressure sections of units shall be tested under negative pressure. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
- D. Panel Deflection Test.
 - 1. The AHU Manufacturer shall conduct factory panel deflection tests on units. Positive-pressure sections of units shall be tested under positive pressure and negative-pressure sections of units shall be tested under negative pressure. Casing deflection shall not exceed $L/200$ at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.
- E. Factory Sound Test: Acoustical performance shall be provided based on AHRI Standard 260 fan in unit testing. Tests shall be in accordance to AMCA 320 for sound and AMCA 210 for airflow performance. Noise measurements shall be measured at the Inlet, Outlet and Casing Radiated positions.

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- F. The AHU Manufacturer shall repair/replace at his own expense any items that fail or are damaged during testing. For any unit that fails testing, the AHU Manufacturer shall retest the unit until all items are in compliance with limits specified herein.
- G. After factory assembly, inspection and testing of units, the AHU Manufacturer shall disassemble each unit (where required) only to the extent necessary for shipment, unless otherwise detailed herein.
- H. The AHU Manufacturer shall legibly mark the parts of work to be erected or field-assembled to enable the Mechanical Contractor to identify the various parts and erect the work without delay.

3.3 SHIPPING

- A. Paper copies of the IOM shall also be shipped with each AHU.
- B. The AHU Manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU Manufacturer shall place them in containers.

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- C. To protect equipment during shipment and delivery, all outdoor units shall be completely shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment.
- D. After loading the equipment for shipment, the AHU Manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.4 ON-SITE STORAGE

- A. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.5 LEVELING

- A. The Mechanical Contractor shall laser level all unit mounting surfaces, including housekeeping pads, roof curbs, and/or structural steel prior to rigging and installation of the AHU units. Should the AHU units be installed on an unlevel surface, the Mechanical Contractor shall rework the installation at his/her own expense and to the satisfaction of the Owner and Engineer and to ensure proper installation.

3.6 FIELD EXAMINATION

- A. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.
- B. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.

3.7 INSTALLATION

- A. The Mechanical Contractor shall be responsible to coordinate ALL of his installation requirements with the Owner and the Owner's selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or -welded joints, and all other installation and assembly requirements.
- B. The AHU Manufacturer shall provide all screws and gaskets for joining of sections in the field.
- C. The AHU Manufacturer shall provide a factory-authorized service representative employed by the AHU Manufacturer to conduct a pre-installation inspection, provide rigging oversight, and supervise the AHU installation work provided by

CUSTOM AIR HANDLING OUTDOOR EQUIPMENT

the Mechanical Contractor. The Mechanical Contractor shall obtain site readiness approval from the AHU Manufacturer prior to proceeding with rigging and installation of AHU units. The Mechanical Contractor shall repair or replace at his/her expense and to the satisfaction of the Owner and Engineer any misalignment or damage that occurs to the AHU units due to the Mechanical Contractor not following the guidance of the factory-authorized service representative employed by the AHU Manufacturer.

- D. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU Manufacturer's final inspection and start-up:
1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
 2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.
 3. All water and steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.
 4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.
 5. All power wiring, including motor starters and disconnects, serving the unit has been completed.
 6. All automatic temperature and safety controls have been completed.
 7. All dampers are fully operational.
 8. All shipping materials have been removed.
 9. All (clean) filter media has been installed in the units.

3.8 FINAL INSPECTION AND START-UP SERVICE

- A. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the factory-authorized service representative employed by the AHU Manufacturer shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.
- B. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start-up.
- C. Under the guidance and supervision of the factory-authorized service representative employed by the AHU Manufacturer the Mechanical Contractor,

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shall perform the following tests and services and submit a report outlining the results:

1. Record date, time, and person(s) performing service.
2. Lubricate all moving parts.
3. Check all motor and starter power lugs and tighten as required.
4. Verify all electrical power connections.
5. Conduct a start-up inspection per the AHU Manufacturer's recommendations.
6. Record fan motor voltage and amperage readings.
7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
8. Check fan for excessive vibration.
9. Check V-belt drive or coupling for proper alignment.
10. Check V-belt drive for proper tension. Tighten the belts in accordance with the AHU Manufacturer's directions. Check belt tension during the second and seventh day's operation and re-adjust belts, as may be required, to maintain proper tension as directed by the AHU Manufacturer.
11. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
12. Disengage all shipping fasteners on vibration isolation equipment.
13. Check safety guards to ensure they are properly secured.
14. Secure all access doors to the fan, the unit and the ductwork.
15. Switch electrical supply "on" and allow fan to reach full speed.
16. Physically check each fan at start-up and shut-down to ensure no abnormal or problem conditions exist.
17. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.
18. Check all control sequences.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: Floor and wall mounted heat pumps.
- B. Related Requirements:
 - 1. Division 01: General Requirements.
 - 2. Division 26: Electrical.
 - 3. Section 07 2100: Thermal Insulation.
 - 4. Section 22 1000: Plumbing.
 - 5. Section 23 0500: Common Work Results for HVAC.
 - 6. Section 23 0513: Basic HVAC Materials and Methods.
 - 7. Section 23 0548: HVAC Sound, Vibration and Seismic Control.
 - 8. Section 23 0900: HVAC Instrumentation and Controls.
 - 9. Section 23 0923: Environmental Control and Energy Management Systems.
 - 10. Section 23 2013: HVAC Piping.
 - 11. Section 23 3000: Air Distribution.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

1.03 QUALITY ASSURANCE

- A. Design, construction, testing and installation shall comply with the following standards as applicable:
 - 1. UL or ETL.
 - 2. ANSI/AHRI Standard 390.
 - 3. ASHRAE/IESNA 90.1.
 - 4. ASHRAE 62.1

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 0500: Common Work Results for HVAC.

1.05 WARRANTY

- A. Compressors shall carry unconditional five year warranty.

PART 2 – PRODUCTS

2.01 EQUIPMENT

- A. Capacities of heat pumps as indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual Project site environmental conditions.
- B. Description: Low noise, high efficiency, single packaged, indoor, floor mounted heat pump unit.

1. Sound Level: The unit shall operate at full load conditions with a maximum sound level of 45 dBA measured at five feet in front of the unit and five feet above the floor.

2. Energy Efficiency: Minimum 10.6 EER.

2.02 OUTDOOR SPLIT SYSTEM HEAT PUMPS

A. GENERAL

1. Outdoor, rooftop or slab mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic, suction gas cooled, direct drive compressor(s) for cooling duty and nickel chromium elements for heating duty.

2. Factory assembled, single- piece outdoor condensing unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start- up.

3. Unit shall use environmentally sound, R-410A refrigerant.

4. Unit shall be installed in accordance with the manufacturer's instructions.

5. Unit must be selected and installed in compliance with local, state, and federal codes.

B. Quality Assurance

1. Unit meets ASHRAE 90.1 minimum efficiency requirements.

2. Unit shall be rated in accordance with AHRI Standards 210/240 or 340/360.

3. Unit shall be designed to conform to ASHRAE 15
4. Unit shall be UL- tested and certified in accordance with ANSI Z21.47 - 2012/CSA 2.3-2012, CSA C22.2 No. 236-11 (UL 1995) 4th edition and CSA C22.2 No. 3 - M 1988.
5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. Unit casing shall be capable of withstanding 750- hour salt spray exposure per ASTM B117 (scribed specimen).
7. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
8. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
9. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box
10. Unit shake tested to Truck 2, ASTM D4169 to ensure shipping reliability.

C. Delivery, Storage, and Handling

1. Unit shall be stored and handled per manufacturer's recommendations.
2. Overhead crane can be used to place the units on a roof using rigging holes built into the unit base rails without any additions to the unit.
3. Unit shall only be stored or positioned in the upright position.

D. Project Conditions

1. As specified in the contract.

E. Operating Conditions

1. Unit shall be capable of starting and running at 125°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at □□10% voltage.
2. Compressor with standard controls shall be capable of operation down to 30°F (-1°C), ambient outdoor temperatures. Optional low ambient kit is available if mechanically cooling at ambient temperatures below 30°F (-1°C).

F. Electrical Requirements

1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.

G. Unit Cabinet

1. Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 3.0 MILS minimum, gloss (per ASTM D523, 60°F / 16°C): 80+/-5, Hardness: H- 2H Pencil hardness.
3. Unit cabinet shall have gas and electric utility knockouts in the side of the unit and in the unit underside. Base of unit shall have a minimum of four locations for through-the- base electrical connections standard.
4. Base Rail
 - a. Unit shall have base rails on a minimum of 4 sides.
 - b. Base rail mounted lifting lugs shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
 - c. Base rail shall be a minimum of 15 gauge thickness.
5. Top panel:
 - a. Shall be a multi piece top panel.
6. Electrical Connections
 - a. All unit power wiring shall enter unit cabinet at a single, factory prepared, and knockout location.
 - b. Through- the- base capability.
 - 1) Standard unit shall have a through- the- base electrical location(s) using a raised, embossed portion of the unit base-pan.
 - 2) Optional, factory approved, water- tight connection method must be used for through- the- base electrical connections.
 - 3) No base-pan penetration, other than those authorized by the manufacturer, is permitted.
7. Units shall meet the wind load requirements under Florida Building Code 2017 as per ASCE 7-16.
 - a. Units are certified with wind resistance ratings of 186 MPH as certified by independent structural engineers.

I. K. Coils

1. Outdoor Coils:

- a. Standard condensing units shall have aluminum Microchannel coils. Standard heat pumps shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
- b. Shall be leak tested to 150 psig, pressure tested to 250 psig, and qualified to CSA C22.2 No. 236-11 (UL 1995) 4th edition burst test at 1775 psig.
- c. Assembled unit shall be pressure tested to 450 psig.

J. Refrigerant Circuits

- 1. Standard Efficiency AC shall utilize 2 independent refrigerant circuits.
- 2. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
 - b. Refrigerant filter drier - Solid core design.
 - c. Service gauge connections on suction and discharge lines.
- 3. Compressors
 - a. Unit shall use fully hermetic scroll compressors for each independent refrigeration circuit.
 - b. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
 - c. Compressors shall be internally protected from high discharge temperature conditions.
 - d. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.
 - e. Compressor shall be factory mounted on rubber grommets.
 - f. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.
 - g. Crankcase heaters shall be installed in the factory for all necessary applications.

K. Condenser Fans and Motors

- 1. Condenser fan motors:
 - a. Shall be a totally enclosed motor.
 - b. Shall use permanently lubricated ball-bearings.
 - c. Shall have inherent thermal overload protection with an automatic reset feature.
 - d. Shall use a shaft- up design.
- 2. Condenser Fans:

- a. Shall be a direct- driven propeller type fan.
- b. Shall have aluminum blades riveted to corrosion- resistant steel spider brackets and be dynamically balanced.

L. Special Features, Options, and Accessories

1. Unit- Mounted, Non- Fused Disconnect Switch:

- a. Switch shall be factory installed, internally mounted.
- b. National Electric Code (NEC) and UL approved non- fused switch shall provide unit power shutoff.
- c. Shall be accessible from outside the unit.
- d. Shall provide local shutdown and lockout capability.

2. Convenience Outlet:

- a. Powered convenience outlet.
 - 1) Outlet shall be powered from main line power to the rooftop unit.
 - 2) Outlet shall be factory installed and internally mounted with easily accessible 115- v female receptacle.
 - 3) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 4) Voltage required to operate convenience outlet shall be provided by a factory installed step- down transformer.
 - 5) Outlet shall be accessible from outside the unit.
- b. Non- Powered convenience outlet.
 - 1) Outlet shall be powered from a separate 115/120v power source.
 - 2) A transformer shall not be included.
 - 3) Outlet shall be factory installed and internally mounted with easily accessible 115- v female receptacle.
 - 4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 5) Outlet shall be accessible from outside the unit.

3. Low Ambient Kit

a. Shall contain an integrated low ambient controller to regulate condenser head pressure at low ambient temperatures by varying the amount of airflow through the condenser.

b. Shall allow units to operate in cooling mode down to 0° F outdoor ambient.

c. Shall be required when mechanical cooling is required at temperatures below 25° F.

4. Reversing DX Valve

a. Provide reversing valve, suction line accumulator, second expansion valve and defrost timer for heat pump operation.

L. Instrumentation and Control Devices for HVAC

1. Thermostats must

a. Energize "Y" when calling for cooling and "W" when calling for heating.

b. Standard Efficiency AC units, shall have capability to energize 2 different stages of cooling, and 2 different stages of heating.

c. For High Efficiency AC units, shall have capability to energize 2 different stages of cooling and 2 different stages of heating.

d. Shall include capability for occupancy scheduling.

M. Direct-Digital Control system for HVAC

1. Shall be ASHRAE 62 compliant.

2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.

3. Shall have an operating temperature range from -40°F to 158°F; 10-90% RH (non-condensing UI), and -4°F to 158°F; 10-90% RH (non-condensing), with a storage temperature range from -40°F to 194°F; 5-95% RH (non-condensing).

4. Shall include an option of an Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary outputs.

5. Controller shall accept the following inputs: space temperature, return air temperature sensor, set point adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock-out, fire/smoke shutdown, single and dual enthalpy, fan status, remote time clock, Sensor Actuator (SA) Bus communicated temperature/humidity/CO2 values from Network sensors, Field Controller (FC) Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.

6. Shall accept a CO2 sensor or multiple CO2 sensors networked together in the conditioned space, and be Demand Control Ventilation (DCV) ready.
7. Shall provide compressor short-cycle protection with minimum compressor runtime set at 5 minutes standard and adjustable from 2 to 7 minutes.
8. Built in lead-lag compressor sequencing to support balanced utilization of refrigerant circuits
9. Shall provide the following outputs: economizer, fan, cooling stage 1, 2. 2 heat stage 1, heat stage 2 , heat stage/ exhaust/ reversing valve/ occupied.
10. Unit shall provide surge protection for the controller through a circuit breaker.
11. Shall have open communication protocols with all required points exposed. Protocols supported include: BACnet®, MS/TP, Modbus®, and N2 communication.
12. Shall have an LCD display on the Unit Control Board to display fault messages as well as navigate the menu structure to review and change set points.
13. Shall utilize a USB connection to allow for uploading and downloading of data.
 - a. USB shall allow for downloading of "trending data" for analysis of inputs and values on other device such as a PC.
 - b. USB shall allow for uploading of new firmware to the UCB.
 - c. USB shall allow for backing up controller set points and parameters and for uploading of these same parameters to the UCB.
14. Shall include an RJ-12 port to be used with a Wi-Fi signal transmitting device and allow unit(s) access via any non-proprietary smart device.
 - a. Unit access shall include ability to view and change all adjustable parameters and set points using the same characteristics and values available directly through the UCB joystick and LCD display.
 - b. Unit access shall be configurable at 3 different levels to allow control over parameter and set point changes.
 - c. Wi-Fi transmitting device can be connected by 3 means.
 - 1) RJ-12 port connected directly to UCB.
 - 2) Optional connection port mounted in operating space.
 - 3) Optional connection to building network allowing unit access from any internet browser worldwide.
15. Shall have the capability to integrate with the Verasys® zoning system.

16. Shall not require any proprietary software or contractor tool to start-up, commission and troubleshoot unit operation.
17. Software upgrades will be accomplished by local download via USB port on main Unit Control Board.
18. Shall be UL Recognized, File E107041, UL 916, Energy management Equipment, UL 1995, Heating and Cooling Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class B, CSA 22.2 No. 236, Signal Equipment Industry Canada, ICES-003 Recognized, and BTL certified.

M. Electric and Electronic Control system for HVAC (Decentralized, outdoor Condensing Units

1. Shall be complete with self- contained low- voltage control circuit protected by a resettable circuit breaker on the 24- v transformer side. Transformer shall have 150VA capability.
 2. Shall utilize color- coded wiring.
 3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
- 23 09 33.23.B.Safeties:
1. Compressor over- temperature, over- current. High internal pressure differential.
 2. Low pressure switch and high pressure switch
 - a. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
 3. Automatic reset, motor thermal overload protector.
 4. Heating section shall be provided with the following minimum protections:
 - a. High temperature limit switches.

2.03

PART 3 – EXECUTION

3.01 GENERAL

- A. Examine areas under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 EQUIPMENT FOUNDATIONS

- A. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Equipment foundations shall be of sufficient size and weight, and of proper design to preclude shifting of equipment under operating conditions, or under any abnormal conditions imposed upon equipment.
- B. Foundations shall meet requirements of equipment manufacturer and, when required by Architect, obtain from equipment manufacturer, approval of foundation design and construction, for equipment to be installed. Equipment vibration shall be maintained within design limits, and shall be dampened and isolated. Isolators shall be bolted to a structural member so as to be readily removable.

3.03 EQUIPMENT DESIGN AND INSTALLATION

- A. Uniformity: Unless otherwise specified, equipment of same type or classification shall be product of same manufacturer.
- B. Application: Only provide equipment as reviewed by Architect.
- C. Equipment Installation: Equipment installation shall be in strict accordance with these Specifications, and installation instructions of manufacturers. Equipment installed on concrete foundations shall be grouted before piping is installed. Piping shall be installed in such a manner as not to place a strain on any of equipment. Flanged joints shall be adequately extended before installation. Piping shall be graded, anchored, guided and supported, without low pockets.
 - 1. Install equipment in a neat and skillful manner, properly aligned, leveled, and adjusted for satisfactory operation.
 - 2. Install so connecting and disconnecting of piping and accessories can be readily accomplished, parts are readily accessible for inspection, service and repair. Space shall be provided to readily remove filters, coils, compressors and fan wheels. Access doors shall be hinged with cam lock door handles.
 - 3. Provide flexible connections for duct, pipe and conduit connections at moving equipment.

3.04 NOISE AND VIBRATION

- A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.
- B. Corrective Measures: If specified noise and/or vibration levels are exceeded, the installing HVAC contractor must provide necessary changes to reduce noise and/or vibration levels to within specified levels.

3.05 FIELD TESTS AND INSPECTION

- A. General: Perform field inspections, field tests, and trial operations as specified in Section 23 0500: Common Work Results for HVAC. Provide labor, equipment and incidentals required for testing. The Project Inspector will witness field tests and trial operations as specified in Section 23 0500: Common Work Results for HVAC.
- B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.
- C. Extent of Field Tests: After installation and before completion, Work of this Section shall be subjected to required field tests, including those specified here and in Section 23 0500: Common Work Results for HVAC.
 - 1. TAB (Test and Balance) and sound level measurement according to SMACNA and ANSI Standard S12.6, respectively, will be performed by a District approved agency. Noise level generated by the HVAC unit measured 5 feet from the unit shall not exceed 45 dBA.
- D. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 0500: Common Work Results for HVAC.

3.06 CONDENSATE DRAIN LINE PIPING

- A. Sleeve penetrations of floors, walls and ceiling to allow for free motion of piping. Provide type L copper pipe and 24 gage chrome-plated escutcheon plates. Pack annular space between pipe and sleeve with incombustible material such as fiberglass and seal each end with mastic to provide a waterproof seal.

3.07 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.08 PROTECTION

- A. Protect Work of this Section until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.03 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
 - 2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
 - 3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.04 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Hot-gas bypass valves.
 - 4. Filter dryers.
 - 5. Strainers.
- B. Welding certificates.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.06 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.07 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.01 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88M, Type A or B).
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
 - 5. Maximum Operating Temperature: 250 deg F (121 deg C).
- G. Check Valves:
 - 1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 - 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 - 3. Piston: Removable polytetrafluoroethylene seat.
 - 4. Closing Spring: Stainless steel.
 - 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 - 6. End Connections: Socket, union, threaded, or flanged.
 - 7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
 - 8. Working Pressure Rating: 500 psig (3450 kPa).
 - 9. Maximum Operating Temperature: 275 deg F (135 deg C).

- H. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
 2. Core: Removable ball-type check valve with stainless-steel spring.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Copper spring.
 5. Working Pressure Rating: 500 psig (3450 kPa).
- I. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24 or 115-V ac coil.
 6. Working Pressure Rating: 400 psig (2760 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
 8. Manual operator.
- J. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 400 psig (2760 kPa).
 6. Maximum Operating Temperature: 240 deg F (116 deg C).
- K. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F (4.4 deg C)
 6. Superheat: Adjustable.

7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 700 psig (4820 kPa).
- L. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 5. Seat: Polytetrafluoroethylene.
 6. Equalizer: External.
 7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.
 8. End Connections: Socket.
 9. Set Pressure: Jamet.
 10. Throttling Range: Maximum 5 psig (34 kPa).
 11. Working Pressure Rating: 500 psig (3450 kPa).
 12. Maximum Operating Temperature: 240 deg F (116 deg C).
- M. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
 2. Screen: 100-mesh stainless steel.
 3. End Connections: Socket or flare.
 4. Working Pressure Rating: 500 psig (3450 kPa).
 5. Maximum Operating Temperature: 275 deg F (135 deg C).
- N. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
 2. Drain Plug: Brass hex plug.
 3. Screen: 100-mesh monel.
 4. End Connections: Socket or flare.
 5. Working Pressure Rating: 500 psig (3450 kPa).
 6. Maximum Operating Temperature: 275 deg F (135 deg C).
- O. Moisture/Liquid Indicators:
1. Body: Forged brass.

2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
 3. Indicator: Color coded to show moisture content in ppm.
 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
 5. End Connections: Socket or flare.
 6. Working Pressure Rating: 500 psig (3450 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
- P. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated charcoal.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig (14 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 240 deg F (116 deg C).
- Q. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated charcoal
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig (14 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 240 deg F (116 deg C).
- R. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or flare.

3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).
- S. Receivers: Comply with ARI 495.
 1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
 2. Comply with UL 207; listed and labeled by an NRTL.
 3. Body: Welded steel with corrosion-resistant coating.
 4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
 5. End Connections: Socket or threaded.
 6. Working Pressure Rating: 500 psig (3450 kPa).
 7. Maximum Operating Temperature: 275 deg F (135 deg C).
- T. Liquid Accumulators: Comply with ARI 495.
 1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or threaded.
 3. Working Pressure Rating: 500 psig (3450 kPa).
 4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.02 REFRIGERANTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
- C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Section 23 0923 "Environmental Control and Energy Management Systems" for solenoid valve controllers and control wiring.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
 - 1. Shot blast the interior of piping.
 - 2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.

3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
 4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
 5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
 6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.
- R. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
 - S. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."
 - T. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
 - U. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
 - V. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.
 - W. Identify refrigerant piping and valves according to Division 15 Section "Identification for HVAC Piping and Equipment."

3.02 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
- H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- 3.03 HANGERS AND SUPPORTS
- A. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
 2. Spring Hangers to support vertical runs.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 2. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
- 3.04 FIELD QUALITY CONTROL
- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
1. Comply with ASME B31.5, Chapter VI.
 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.

- c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
- d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.05 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
 - 4. Charge system with a new filter-dryer core in charging line.

3.06 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common electrical installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So, connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel..
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc

- B. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
- C. Pressure Plates: Carbon steel. Include two for each sealing element.
 - a. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
- I. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 26 05 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.
- B. Related Sections include the following:
 - 1. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized

testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Alcan Products Corporation; Alcan Cable Division.
 2. American Insulated Wire Corp.; a Leviton Company.
 3. General Cable Corporation.
 4. Senator Wire & Cable Company.
 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. O-Z/Gedney; EGS Electrical Group LLC.

4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.
- F. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- I. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.
- J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- K. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- L. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
 - 1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
 - 2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both wall surfaces.
- G. Extend sleeves installed in floors 2 inches above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

3.9 Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

- A. Perform tests and inspections and prepare test reports.

- B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

- C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 05 19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Multimode optical-fiber cabling.
 - 2. UTP cabling.
 - 3. RS-485 cabling.
 - 4. Low-voltage control cabling.
 - 5. Control-circuit conductors.
 - 6. Identification products.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- C. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.
- D. RCDD: Registered Communications Distribution Designer.
- E. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PERFORMANCE REQUIREMENTS

- A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
 - 1. Flame Travel Distance: 60 inches or less.
 - 2. Peak Optical Smoke Density: 0.5 or less.
 - 3. Average Optical Smoke Density: 0.15 or less.
- B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.3 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."
- B. Painting: Paint plywood on all sides and edges with flat latex paint.

2.4 OPTICAL-FIBER CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Belden Inc.
 - 2. CommScope, Inc.
 - 3. Corning Incorporated.
 - 4. Emerson Connectivity Solutions.
 - 5. General Cable Technologies Corporation.
 - 6. 3M.
 - 7. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Description: Multimode, 50/125-micrometer, 24-fiber, nonconductive, tight-buffer, optical-fiber cable.
 - 1. Comply with ICEA S-83-596 for mechanical properties.
 - 2. Comply with TIA-568-C.3 for performance specifications.
 - 3. Comply with TIA-492AAAA-B for detailed specifications.
 - a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
 - b. Riser Rated, Nonconductive: Type OFNR or Type OFNP, complying with UL 1666.
 - c. Riser Rated, Nonconductive: Type OFNP or Type OFNR in listed riser or plenum communications raceway.
 - d. Riser Rated, Nonconductive: Type OFN, Type OFNG, Type OFNP, or Type OFNR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - e. General Purpose, Nonconductive: Type OFN, Type OFNG, Type OFNP, or Type OFNR in metallic conduit.
 - f. Plenum Rated, Conductive: Type OFC, Type OFN, Type OFCG, Type OFNG, Type OFCP, Type OFNP, Type OFCR, or Type OFNR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - g. Riser Rated, Conductive: Type OFC, Type OFN, Type OFCG, Type OFNG, Type OFCP, Type OFNP, Type OFCR, or Type OFNR in metallic conduit.

- h. General Purpose, Conductive: Type OFC, Type OFN, Type OFCG, Type OFNG, Type OFCP, Type OFNP, Type OFCR, or Type OFNR in metallic conduit.
 - 4. Conductive cable shall be aluminum-armored type.
 - 5. Maximum Attenuation: 3.5 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
 - 6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- C. Jacket:
- 1. Jacket Color: Aqua for 50/125-micrometer cable.
 - 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
 - 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.5 OPTICAL-FIBER CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- 1. Belden Inc.
 - 2. Corning Incorporated.
 - 3. Dynacom Inc.
 - 4. Hubbell Incorporated.
 - 5. Panduit Corp.
 - 6. Siemon Company (The).
- B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
- 1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.
- D. Cable Connecting Hardware:
- 1. Comply with Optical-Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA-568-C.3.
 - 2. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss of not more than 0.75 dB.
 - 3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.6 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Alpha Wire Company; a division of Belden Inc.
 2. Belden Inc.
 3. CommScope, Inc.
 4. 3M.
 5. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Description: 100-ohm, four-pair UTP, 25-pair UTP covered with a thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties of Category 5e cables.
 2. Comply with ICEA S-102-700 for mechanical properties of Category 6 cables.
 3. Comply with TIA-568-C.1 for performance specifications.
 4. Comply with TIA-568-C.2, Category 6.
 5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with NEMA WC 66, UL 444 and NFPA 70 for the following types:
 - a. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - b. Communications, Riser Rated: Type CMP or Type CMR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - c. Communications, General Purpose: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - d. Communications, Limited Purpose: Type CMX; or Type CM, Type CMG, Type CMP, or Type CMR.

2.7 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Belden Inc.
 2. Dynacom Inc.
 3. Hubbell Incorporated.

4. Leviton Commercial Networks Division.
 5. Panduit Corp.
 6. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
1. Number of Jacks per Field: One for each four-pair UTP cable indicated.
- F. Jacks and Jack Assemblies: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C.1.
- G. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
- H. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.
- I. Faceplates:
1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
 2. Metal Faceplate: Brass, complying with requirements in Section 262726 "Wiring Devices."
 3. For use with snap-in jacks accommodating any combination of UTP, optical-fiber, and coaxial work area cords.
 - a. Flush-mounted jacks, positioning the cord at a 45-degree angle.

J. Legend:

1. Factory labeled by silk-screening or engraving for brass faceplates.

2.8 TWIN-AXIAL DATA HIGHWAY CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 4 pairs, No. 22 AWG, stranded (7x28) tinned-copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with UL 1685.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 4 pairs, No. 22 AWG, stranded (7x28) tinned-copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.9 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CMG.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262.

2.10 LOW-VOLTAGE CONTROL CABLE

- A. Paired Cable: NFPA 70, Type CMG.
 - 1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with UL 1685.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - 1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with NFPA 262.

2.11 CONTROL-CIRCUIT CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Encore Wire Corporation.
 - 2. General Cable Technologies Corporation.
 - 3. Southwire Company.
- B. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.
- C. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.
- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- E. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.
 - 1. Smoke control signaling and control circuits.

2.12 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.

- B. Factory test UTP cables according to TIA-568-C.2.
- C. Factory test optical-fiber cables according to TIA-568-C.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
 - 1. Test optical-fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
 - 2. Test optical-fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
 - 3. Test each pair of UTP cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
 - 2. Outlet boxes for optical-fiber cables shall be no smaller than 4 inches square by 2-1/8 inches deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
 - 3. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.

2. Install cable trays to route cables if conduits cannot be located in these positions.
 3. Secure conduits to backboard if entering the room from overhead.
 4. Extend conduits 3 inches above finished floor.
 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- E. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. General Requirements for Cabling:
1. Comply with TIA-568-C Series of standards.
 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems."
 3. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 4. Cables may not be spliced.
 5. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Install lacing bars and distribution spools.
 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
 9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Monitor cable pull tensions.
 10. Support: Do not allow cables to lay on removable ceiling tiles.
 11. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
- C. UTP Cable Installation:
1. Comply with TIA-568-C.2.

2. Install termination hardware as specified in Section 271500 "Communications Horizontal Cabling" unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."

E. Optical-Fiber Cable Installation:

1. Comply with TIA-568-C.3.
2. Terminate cable on connecting hardware that is rack or cabinet mounted.

F. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

G. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Below each feed point, neatly coil a minimum of 72 inches of cable in a coil not less than 12 inches in diameter.

H. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches.

- c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches.
- 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches.
- 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches.
- 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.
- 6. Separation between Communications Cables and LED Fixtures: A minimum of 5 inches.

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.5 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
 - 1. Class 1 remote-control and signal circuits; No 14 AWG.
 - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
 - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

- A. Comply with TIA-569-B, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Visually inspect UTP and optical-fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test UTP cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy

(Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical-Fiber Cable Tests:

- a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.0. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- b. Link End-to-End Attenuation Tests:
 - 1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for links shall be less than 2.0 dB.
- C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 26 05 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Ground rings.
 - 4. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Instructions for periodic testing and inspection of grounding features at test wells based on NFPA 70B.
 - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - 2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Burndy; Part of Hubbell Electrical Systems.
 2. ERICO International Corporation.
 3. Fushi Copperweld Inc.
 4. ILSCO.
 5. O-Z/Gedney; A Brand of the EGS Electrical Group.
 6. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 12 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
 - 1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
 - 2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.

- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate

conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare, tinned copper, not less than No. 8 AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 - 3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
 2. Bury ground ring not less than 24 inches from building's foundation.
- I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and

connect to building's grounding grid or to grounding electrode external to concrete.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- E. Grounding system will be considered defective if it does not pass tests and inspections.

- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
 - 5. Substations and Pad-Mounted Equipment: 5 ohms.
 - 6. Manhole Grounds: 10 ohms.
 - 7. ohms.
- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. Thomas & Betts Corporation.
 - e. Unistrut; Tyco International, Ltd.
 - 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 4. Channel Dimensions: Selected for applicable load criteria.

- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels, and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 - 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 - 3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
 - 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc. ICC# ECR-1663
 - 2) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit. ICC# ECR-3037

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc. ICC# ECR-2302
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc. ICC# ECR-2427
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033053 "Miscellaneous Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

- B. Related Requirements:

1. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. LEED Submittals:
 1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 1. Structural members in paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Allied Tube & Conduit; a Tyco International Ltd. Co.

2. O-Z/Gedney; a brand of EGS Electrical Group.
 3. Republic Conduit.
 4. Southwire Company.
 5. Thomas & Betts Corporation.
 6. Western Tube and Conduit Corporation.
 7. Wheatland Tube Company; a division of John Maneely Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit IMC.
1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch, minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew or compression.
 2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.
 2. CANTEX Inc.
 3. Condux International, Inc.
 4. Electri-Flex Company.
 5. RACO; a Hubbell company.
 6. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. LFNC: Comply with UL 1660.
- F. Rigid HDPE: Comply with UL 651A.
- G. Continuous HDPE: Comply with UL 651B.
- H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- I. RTRC: Comply with UL 1684A and NEMA TC 14.
- J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- K. Fittings for LFNC: Comply with UL 514B.
- L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- M. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper B-Line, Inc.
 2. Hoffman; a Pentair company.
 3. Mono-Systems, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Flanged-and-gasketed type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Moulded Products, Inc.
 2. Hoffman; a Pentair company.
 3. Lamson & Sessions; Carlon Electrical Products.
 4. Niedax-Kleinhuis USA, Inc.
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

- D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- E. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Prime coated, ready for field painting.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Mono-Systems, Inc.
 - b. Panduit Corp.
 - c. Wiremold / Legrand.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from custom colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following] available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems Division.
 - b. Mono-Systems, Inc.
 - c. Panduit Corp.
 - d. Wiremold / Legrand.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Technologies Company; Cooper Crouse-Hinds.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman; a Pentair company.
 5. Hubbell Incorporated; Killark Division.
 6. O-Z/Gedney; a brand of EGS Electrical Group.
 7. RACO; a Hubbell Company.
 8. Thomas & Betts Corporation.
 9. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
1. Material: Cast metal.
 2. Type: Fully adjustable.
 3. Shape: Rectangular.
 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep.
- K. Gangable boxes are prohibited.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Fiberglass.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. CDR Systems Corporation; Hubbell Power Systems.
 - c. Oldcastle Precast, Inc.; Christy Concrete Products.
 - d. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC." OR "Telecommunication".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of reinforced concrete.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation; Hubbell Power Systems.
 - d. NewBasis.
 - e. Nordic Fiberglass, Inc.
 - f. Oldcastle Precast, Inc.; Christy Concrete Products.
 - g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
 2. Standard: Comply with SCTE 77.
 3. Color of Frame and Cover: Green.
 4. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
 5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 7. Cover Legend: Molded lettering, "ELECTRIC."
 8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: EMT.
 3. Underground Conduit: RNC, Type EPC-80-PVC, concrete encased.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed, Not Subject to Severe Physical Damage: RNC identified for such use.
 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: GRC.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from PVC to GRC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit.
 2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength.
 3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or

equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
- 2. Sleeve-seal systems.
- 3. Sleeve-seal fittings.
- 4. Grout.
- 5. Silicone sealants.

B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

- 1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Sleeves for Rectangular Openings:
 1. Material: Galvanized sheet steel.
 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Carbon steel.
 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Presealed Systems.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
 2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

- a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
- 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with 2019 California Electrical Code.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. White letters on an black field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
 - 1. Black letters on an orange field.
 - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."
- D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

- F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.
- H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- I. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

- G. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.
- H. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Write-on, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- G. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.4 FLOOR MARKING TAPE

- A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Detectable Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

C. Tag: Type I:

1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: 4 mils.
3. Weight: 18.5 lb/1000 sq. ft..
4. 3-Inch Tensile According to ASTM D 882: 30 lbf, and 2500 psi.

D. Tag: Type II:

1. Multilayer laminate consisting of high-density polyethylene scrim coated with pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: 12 mils.
3. Weight: 36.1 lb/1000 sq. ft..
4. 3-Inch Tensile According to ASTM D 882: 400 lbf, and 11,500 psi.

E. Tag: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft..
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

F. Tag: Type IID:

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 8 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 34 lb/1000 sq. ft.
5. 3-Inch Tensile According to ASTM D 882: 300 lbf, and 12,500 psi.

2.6 WARNING LABELS AND SIGNS

A. Comply with 2019 California Electrical Code and 29 CFR 1910.145.

B. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

C. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.9 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

- K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot maximum intervals.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:

- 1) Phase A: Black.
- 2) Phase B: Red.
- 3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

- 1) Phase A: Brown.
- 2) Phase B: Orange.
- 3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

- F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.
- G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.
- I. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.
- J. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- K. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- L. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.

2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- M. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- N. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- O. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- P. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to Be Labeled:

- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
- b. Enclosures and electrical cabinets.
- c. Access doors and panels for concealed electrical items.
- d. Switchboards.
- e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
- f. Emergency system boxes and enclosures.
- g. Enclosed switches.
- h. Enclosed circuit breakers.
- i. Enclosed controllers.
- j. Push-button stations.
- k. Contactors.
- l. Remote-controlled switches, dimmer modules, and control devices.
- m. Monitoring and control equipment.

END OF SECTION 26 05 53

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Time switches.
 - 2. Photoelectric switches.
 - 3. Standalone daylight-harvesting switching controls.
 - 4. Indoor occupancy sensors.
 - 5. Emergency shunt relays.
- B. Related Requirements:
 - 1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Industries, Inc.
 2. Intermatic, Inc.
 3. Leviton Mfg. Company Inc.
 4. NSi Industries LLC; TORK Products.
 5. Tyco Electronics; ALR Brand.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
1. Listed and labeled as defined in 2019 California Electrical Code, by a qualified testing agency, and marked for intended location and application.
 2. Contact Configuration: DPST.
 3. Contact Rating: 20-A ballast load, 120-/240-V ac.
 4. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
 5. Astronomic Time: All channels.
 6. Automatic daylight savings time changeover.
 7. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.
- C. Electromechanical-Dial Time Switches: Comply with UL 917.
1. Listed and labeled as defined in 2019 California Electrical Code, by a qualified testing agency, and marked for intended location and application.
 2. Contact Configuration: DPST.
 3. Contact Rating: 20-A ballast load, 120-/240-V ac.
 4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
 5. Astronomic time dial.
 6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
 7. Skip-a-day mode.
 8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Bryant Electric; a Hubbell company.
 2. Cooper Industries, Inc.
 3. Hubbell Building Automation, Inc.
 4. Leviton Mfg. Company Inc.
 5. Lutron Electronics Co., Inc.
 6. NSi Industries LLC; TORK Products.
 7. Sensor Switch, Inc.
 8. Square D; a brand of Schneider Electric.
 9. Watt Stopper.
- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 7. Bypass Switch: Override the "on" function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy .
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot- high ceiling in a corridor not wider than 14 feet.
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Industries, Inc.

2. Hubbell Building Automation, Inc.
3. Leviton Mfg. Company Inc.
4. NSi Industries LLC; TORK Products.
5. Sensor Switch, Inc.
6. Square D; a brand of Schneider Electric.
7. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor 180-Degree:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP, dual circuit. SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

D. Wall-Switch Sensor 210-Degree:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.
3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.

8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.4 EMERGENCY SHUNT RELAY

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Lighting Control and Design; Acuity Lighting Group, Inc.
 2. Watt Stopper.
- B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
 1. Coil Rating: 120 277 V.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Lighting control devices will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 26 09 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Receptacles with integral surge-suppression units.
 - 4. Isolated-ground receptacles.
 - 5. Weather-resistant receptacles.
 - 6. Wall-switch and exterior occupancy sensors.
 - 7. Communications outlets.
 - 8. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Service/Power Poles: One for every 10, but no fewer than one.
 - 2. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
 - 3. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.
 - 4. TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand (Pass & Seymour).

- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; IG5362RN.
 - b. Hubbell; IG5362.
 - c. Leviton; 5362-IG.
 - d. Pass & Seymour; IG5362.
 - 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be

integral to receptacle construction and not dependent on removable parts.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GFR5352L.
 - c. Pass & Seymour; 2095.
 - d. Leviton; 7590.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hubbell; GFTR20.
 - b. Pass & Seymour; 2095TR.

2.5 TVSS RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

B. Duplex TVSS Convenience Receptacles:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 5362BLS.
 - b. Hubbell; HBL5362SA.
 - c. Leviton; 5380.
 - d. Pass & Seymour; 5362BLSP.
 2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
- C. Isolated-Ground, Duplex Convenience Receptacles:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; IG5362BLS.
 - b. Hubbell; IG5362SA.
 - c. Leviton; 5380-IG.
 - d. Pass & Seymour; IG5362BLSP.
 2. Description:
 - a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; CWL520R.
 - b. Hubbell; HBL2310.
 - c. Leviton; 2310.
 - d. Pass & Seymour; L520-R.
- B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; IGL520R.
 - b. Hubbell; IG2310.
 - c. Leviton; 2310-IG.
 - d. Pass & Seymour; IG4700.
2. Description:
 - a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.7 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Single Pole:
 - 2) Cooper; AH1221.
 - 3) Hubbell; HBL1221.
 - 4) Leviton; 1221-2.
 - 5) Pass & Seymour; CSB20AC1.
 - 6) Two Pole:
 - 7) Cooper; AH1222.
 - 8) Hubbell; HBL1222.
 - 9) Leviton; 1222-2.
 - 10) Pass & Seymour; CSB20AC2.
 - 11) Three Way:
 - 12) Cooper; AH1223.
 - 13) Hubbell; HBL1223.
 - 14) Leviton; 1223-2.
 - 15) Pass & Seymour; CSB20AC3.
 - 16) Four Way:
 - 17) Cooper; AH1224.
 - 18) Hubbell; HBL1224.
 - 19) Leviton; 1224-2.
 - 20) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; AH1221PL for 120 and 277 V.
 - b. Hubbell; HBL1201PL for 120 and 277 V.
 - c. Leviton; 1221-LH1.
 - d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; AH1221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.
 - d. Pass & Seymour; PS20AC1-L.
2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 1995L.
 - b. Hubbell; HBL1557L.

- c. Leviton; 1257L.
- d. Pass & Seymour; 1251L.

2.8 DECORATOR-STYLE DEVICES

- A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 6252.
 - b. Hubbell; DR15.
 - c. Leviton; 16252.
 - d. Pass & Seymour; 26252.
- B. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
 - 1. Products: Subject to compliance with requirements,:
 - a. Cooper; TR6252.
 - b. Hubbell; DR15TR.
 - c. Pass & Seymour; TR26252. number(s)>.
 - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- C. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; TWRBR15.
 - b. Hubbell; DR15TR.
 - c. LevitonTRW15.
 - d. Pass & Seymour; TRW26252.
 - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

- D. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; VGF15.
 - b. Hubbell; GF15LA.
 - c. Leviton; 8599.
 - d. Pass & Seymour; 1594.
- E. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; TWRVGF15.
 - b. Hubbell; GFTR15.
 - c. Pass & Seymour; 1594TRWR.
 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 7621 (single pole), 7623 (three way).
 - b. Hubbell; DS115 (single pole), DS315 (three way).
 - c. Leviton; 5621-2 (single pole), 5623-2 (three way).
 - d. Pass & Seymour; 2621 (single pole), 2623 (three way).
- G. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 7631 (single pole), 7633 (three way).

- b. Hubbell; DS120IL (single pole), DS320 (three way).
- c. Leviton; 5631-2 (single pole), 5633-2 (three way).
- d. Pass & Seymour; 2625 (single pole), 2626 (three way).

2. Description: With neon-lighted handle, illuminated when switch is "off."

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.11 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems.
 - 2. Wiremold/Legrand.
- B. Description:
 - 1. Two-piece surface metal raceway, with factory-wired multioutlet harness.

2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: PVC.

D. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
2. Receptacle Spacing: 9 inches.
3. Wiring: No. 12 AWG solid, Type THHN copper, two circuit, connecting alternating receptacles.

2.12 SERVICE POLES

A. Description:

1. Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
2. Poles: Nominal 2.5-inch- square cross section, with height adequate to extend from floor to at least 6 inches above ceiling, and with separate channels for power wiring and voice and data communication cabling.
3. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
4. Finishes: Satin-anodized aluminum.
5. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, four-pair, Category 3 or Category 5 voice and data communication cables.
6. Power Receptacles: Two duplex, 20-A, straight-blade receptacles complying with requirements in this Section.
7. Voice and Data Communication Outlets: Four RJ-45 jacks complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.13 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: White <Insert color> unless otherwise indicated or required by NFPA 70 or device listing.
2. TVSS Devices: Blue.
3. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 27 26

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600-V ac and less for use in control circuits enclosed switches enclosed controllers.
 - 2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches.
 - 3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
 - 4. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Current-limitation curves for fuses with current-limiting characteristics.
 - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit on translucent log-log graph paper.

5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Ambient temperature adjustment information.
 2. Current-limitation curves for fuses with current-limiting characteristics.
 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit on translucent log-log graph paper.
 4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

1.7 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.8 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Ferraz Shawmut, Inc.
 - 4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
 - 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
 - 1. Motor Branch Circuits: Class RK5, time delay.
 - 2. Other Branch Circuits: Class RK1, time delay.
 - 3. Control Circuits: Class CC, fast acting.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.
- C. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Receptacle switches.
 - 4. Shunt trip switches.
 - 5. Molded-case circuit breakers (MCCBs).
 - 6. Molded-case switches.
 - 7. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Fuse Pullers: Two for each size and type.

1.9 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 - 2. Altitude: Not exceeding 6600 feet.

1.11 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 1. Instantaneous trip.
 2. Long- and short-time pickup levels.
 3. Long- and short-time time adjustments.
 4. Ground-fault pickup level, time delay, and I²t response.
- F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Communication Capability: Circuit-breaker-mounted Integral communication module with functions and features compatible with power monitoring and control system, specified in Section 260913 "Electrical Power Monitoring and Control."
6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
8. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
11. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.
13. Accessory Control Power Voltage: Integrally mounted, self-powered; 120-V ac.

2.3 MOLDED-CASE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

- B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Features and Accessories:
 - 1. Standard frame sizes and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - 6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
 - 7. Alarm Switch: One NO contact that operates only when switch has tripped.
 - 8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
 - 9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
 - 10. Electrical Operator: Provide remote control for on, off, and reset operations.
 - 11. Accessory Control Power Voltage: Integrally mounted, self-powered; 120-V ac.

2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

END OF SECTION 26 28 16

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: LED Luminaires, LED modules, drivers, wiring, and lighting controls.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 26 0500: Common Work Results for Electrical.
 - 3. Section 26 0513: Basic Electrical Materials and Methods.
 - 4. Section 26 0526: Grounding and Bonding.
 - 5. Section 26 0519: Low-Voltage Wires (<600 Volt AC).
 - 6. Section 26 0923: Lighting Controls Systems.
 - 7. Section 26 5200: - Emergency Power Systems.
 - 8. Section 32 1313 - Site Concrete Work.

1.2 REFERENCES

- A. American National Standards Institute/American National Standard Lighting Group ANSI/ANSLG – C78.377-2008 Specifications for the Chromaticity of Solid-State Lighting Products.
- B. American National Standards Institute/American National Standard Lighting Group ANSI/ANSLG – C82.77-2002 Harmonics Emission Limits.
- C. Federal Communication Commission (FCC) 47 CFR Part 15 – Radio Frequency Devices.
- D. Illuminating Engineering Society of North America (IESNA) LM-79-, LM-80-15, and TM-21.
- E. National Electrical Manufacturers Association (NEMA) SSL-1-2010 Electronic Drivers for LED Devices, Arrays, or Systems.
- F. SSL-3-2010 Solid State Lighting High Power LED Binning for General Illumination.
- G. SSL-4-2012 Solid State Lighting Retrofit Lamps.
- H. National Fire Protection Association (NFPA) NEC-70-2011
- I. Underwriters Laboratories (UL) 8750-Light Emitting Diode (LED) Equipment for Use in Lighting Products.

- J. Underwriters Laboratories (UL) 1598C- Light Emitting Diode (LED) Retrofit Luminaire Conversion Kits.

1.3 SUBMITTALS

- A. List of Materials: Submit a complete list of proposed materials.
- B. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size of lamps, and complete details of method of fitting suspension and fastening luminaires in place. Provide wiring diagrams for lighting control equipment. Drawings shall contain sufficient information to assemble and install equipment at the Project site without further instructions.
- C. Prior to start of construction; provide photometric calculations with graphic of lighting foot-candle levels at work plane, ceiling and walls. Calculations shall comply with IESNA recommendations.
- D. Installation Instructions: Submit manufacturer's written installation instructions for luminaires and accessories.

1.4 SUBSTITUTIONS

- A. Luminaires that deviate from these requirements shall not be accepted without written approval from OWNER'S Design Standards Section and Maintenance and Operations Technical Unit. When deviating or substituting luminaires, the following information shall be submitted:
 - 1. Substitution request form substantiating reasons and benefits to OWNER.
 - 2. OWNER'S approval shall be obtained for any equipment or materials substitutions. Proposed substitutions requests shall provide proof of compliance with OWNER'S LED Luminaires Evaluation Requirements found at the following electronic address:
- B. Substitutions: Submittals must comply with contract general provisions.

1.5 QUALITY ASSURANCE

- A. Design of lighting luminaires, accessories, supports, and method of luminaire installation shall comply with requirements for earthquake-resistant construction of the State of California.
- B. Provide suspension points at no more than two feet from luminaire ends. Spacing between supports shall not exceed eight feet.

- C. Components and luminaires shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes, including those mentioned under article 1.02 – References.

1.6 WARRANTY

- A. Provide a one-year labor warranty.
- B. Provide material warranty as specified:
 - 1. LED modules: five years minimum.
 - 2. Drivers: five years minimum.
 - 3. Lighting Pole (Standards): five year minimum.
- C. Warranty period begins at substantial completion or project acceptance for beneficial occupancy.
- D. CONTRACTOR shall warranty Luminaires, including drivers, LED modules and ancillary components via a single warranty source. Multiple warranty sources are not acceptable.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

- A. Lighting luminaires shall be the type indicated on Drawings and as specified. Luminaires of same type shall be of one manufacturer.
- B. Specific manufacturer and model number references are indicated as a standard of performance and quality; other manufacturers' models may be submitted for review, provided the product meets or exceeds the specifications and substantially complies with OWNER'S LED Luminaires Evaluation Requirements Form.
- C. Conductors that pass over edges or through metal opening(s) shall be secured from contacting the edges or be protected from cutting and abrasion. This requirement shall be met through one of the following:
 - 1. Rolling the edge of the metal not less than 120 degrees.
 - 2. A bushing or grommet of a material other than rubber at least 1.2 mm (0.047") thick.
 - 3. Glass sleeving at least 0.025 mm (0.010") thick.
- D. Lighting luminaires shall meet the following requirements:

1. Industry standards as indicated under REFERENCES Article.
2. Luminaire shall be from a manufacturer who has been in the business of manufacturing LED lighting luminaires for interior and exterior applications for a minimum of 5 years.
3. Luminaires shall comply with the California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency and Toxics Reduction Act, or be in compliance with the European Restriction of Hazardous Substances (RoHS), whichever is more stringent.
4. Luminaires shall be baked-on enamel or powder-coated, unless otherwise specified in this section.
5. The luminaire(s) lens, including end caps shall be 0.187 nominal thickness.
6. Drivers shall be easily accessible without the use of special tools.
7. Wiring cavity shall be field accessible for service or repairs.
8. Luminaires shall be capable of being operated by standard motion/vacancy sensors, daylight sensors, and dimmers.
9. Luminaires shall be provided with a manufacturer's stencil or permanent legible sticker that states manufacturer business information and date of delivery.
10. Temperature rating; -20 degrees Celsius minimum starting temperature. Luminaire accessories including LEDs and drivers shall be able to withstand temperatures in excess of 110 Fahrenheit degrees.
11. Color Rendering Index (CRI):
 - a. Interior Applications: +82 CRI.
 - b. Exterior Applications: +70 CRI
12. Power factor: Greater than 0.9 at 120V and 277V.
13. Total Harmonic Distortion: Less than 20% at 120V and 277V.
14. Color Correlated Temperature: 4000K minimum \pm 275K degrees.
15. LEDs and driver's life expectancy: 50,000 minimum projected hours at 6,000 hours testing for both LEDs and drivers.
16. Luminaires in contact with insulation materials shall be IC rated.

2.2 DRIVERS AND LED MODULES

A. Drivers:

1. Approved Drivers Manufacturers:
 - a. Osram – Optotronic.
 - b. Philips – Advance and Xitanium.
 - c. Universal Lighting Technologies – Everline.
 - d. General Electric – Lightech.
 - e. Thomas Research Products
 - f. Kenall – Low Profile LED Driver
 - g. EldoLED

- h. Others only if approved by Torrance Airport M&O Technical Services and Design Standards units.

2. Driver Type and Characteristics:

- a. Comply with the state of California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency and Toxics Reduction Act, or be RoHS compliant, whichever is more stringent.
- b. Dimming for 0-10 volt DC control circuits. Drivers shall be specifically compatible with the lighting control system being provided.
- c. Comply with applicable state, federal, and industry standards listed under References article.
- d. Wattage as stated in Luminaire's LM-79 test report.
- e. Driver performance requirements:

DRIVERS PERFORMANCE CHARACTERISTICS		
No.	Characteristic	Minimum Requirements
1	Input Voltage range	120V, 277V
2	Input Overvoltage	320 VAC for 48 hours, 350 VAC for 2 hours.
3	Frequency	50/60 Hz Nominal
4	Power factor	0.95 Minimum
5	Inrush Current	Less than 30 amps @ 120V, Less than 70A @ 277V
6	Input Current Range	54A @ 120V, 23A @ 277V
7	Output Current	1670 mA Maximum
8	Maximum Power	65 Watts
9	Total Harmonic Distortion	Less than 20%
10	Leakage Current	Less than 500 mA
11	Output Protection	Short and Open Circuit
12	Maximum Case	90° C
13	Minimum Starting	-20° C
14	Storage Temperature	No less than 70° C
15	Humidity	Rated for dry and damp
16	Cooling	Convection
17	Sound Rating	Class A

18	Life Expectancy	>50,000 hours at +50° C
19	Dimming, Motion Sensors and Daylight Sensors	0-10V

B. LEDs:

1. Approved Manufacturers:

- a. General Electric.
- b. Philips.
- c. NICHIA
- d. Samsung LED Co.
- e. CREE

2. LEDs Characteristics:

- a. Color Correlated Temperature (CCT):
 - 1) Chromaticity target Duv and tolerance 0.001 plus/minus 0.006.
 - 2) Nominal CCT for 4000K, target CCT 3985K \pm 275K.
 - 3) CCT measurements in compliance with ANSI C78.377-2008.
- b. Lumen Maintenance: Greater than 90% at 500 C degrees.
- c. LEDs must be from same manufacturer and batch.
- d. TM-21 and LM-80 reported hours of no less than 50,000.
- e. LM-79 reported CCT and CRI in compliance with articles 2.09.D.9 and 12.

2.3 LUMINAIRES (For exact make and model refer to lighting fixture schedule on electrical plans)

A. Lighting Luminaire Types:

1. Ceiling Surface-mounted or Recessed Troffer Luminaires:

- a. 22 gage extruded aluminum doorframes, white baked enamel finish. Spring loaded and half recessed with flush latches and T-handle hinge, accessible from bottom to drivers and wiring. Clear prismatic 100 percent pure virgin acrylic Pattern 12.
- b. Recessed Troffer Housing minimum depth shall be 4 ½-inch to eliminate lamp images in lens.
- c. Minimum lens thickness 0.187 inch.
- d. Furnish mounting frames on recessed luminaires in plaster and tile surfaces.
- e. Manufacturers and catalog numbers: Modify catalog numbers for mounting in gypsum drywall ceilings, as required.

2. Surface-Mounted Industrial Luminaires:
 - a. Approximately 48-inch or 96-inch long by 16-inch wide by 7 ½-inch deep.
 - b. Provide couplings, clips and end caps for continuous row installation.
 - c. Furnish luminaires with screw-on wire guards. Design guards to accommodate luminaire, provided by same manufacturer as luminaire.
 - d. Exposed LED strips are not allowed.
 - e. Housing shall be made of die formed 20 gage cold rolled steel.
3. Surface Mounted Strip Light:
 - a. Luminaire shall be made of 20 gage die formed steel and have the ability for continuous row mounting.
 - b. Furnish luminaires with LED strips as indicated on drawings. Luminaire shall have the option to have narrow or wider housing channels depending on the application.
4. Enclosed and Vandal Resistant Luminaires:
 - a. Luminaire shall be 20 gage extruded aluminum with die cast end caps.
 - b. Luminaire shall have opal polycarbonate lens.
 - c. Furnish luminaires with LED strips as indicated on drawings. Luminaire shall have tamper resistant hardware.
 - d. Luminaire shall have the ability to be in continuous rows with seamless appearance.
 - e. Luminaire shall be listed for wet location.
5. Enclosed, Gasketed Luminaire:
 - a. Luminaire shall be 20 gage steel.
 - b. Lens enclosure shall be heavy duty vapor tight enclosed gasketed with closed-cell foam gasketing permanently attached to luminaire housing.
 - c. Luminaire shall have tamperproof latches.
 - d. Luminaire shall be furnished with minimum one watertight hub kit for top or end conduit entry.
 - e. Luminaire shall have option for cable mount and safety strap
 - f. Wet Location listed.
6. Surface, Wall or Recess Mounted fixtures
 - a. Luminaire shall be 20 gage extruded aluminum with die cast end caps.
 - b. Opal polycarbonate lens.
 - c. Furnish luminaires with LED strips as indicated on drawings.

- d. Luminaire mounting as indicated on drawings.
 - e. Luminaire shall be listed for damp and wet location.
7. Down Lights:
- a. 4 to 6 inch round LED downlight.
 - b. Color trim as specified in construction drawings.
 - c. Trim attachment to frame-in kit via push-in connector on frame.
 - d. Removable cover for access.
 - e. Complete luminaire including all peripheral devices including frame-in kit, light engine, trim kit, etc. shall be provided.
8. High Abuse Surface Luminaires:
- a. Lens shall be extruded polycarbonate, clear prismatic refractor, nominal thickness 0.125 inch, UV stabilized.
 - b. Baseplate shall be 18 gage prime cold-rolled steel with corrosion-resistant, 92 percent reflective, white polymer finish.
 - c. End caps shall be 16 gage prime cold roll steel with corrosion-resistant, white polymer finish and shall be spot welded to the baseplate.
 - d. Lens/housing shall be furnished with a minimum of two large or four small stainless steel fasteners to secure lens/housing to base plate.
 - e. Listed for wet and damp locations.
9. Wall Mounted Vaportite Luminaire:
- a. Luminaire housing shall be die cast aluminum with corrosion resistant polyester powder coated finish.
 - b. Luminaire shall be heat and shock resistant, with prismatic glass optical chamber with neoprene gasketing.
 - c. Luminaire shall be 15 or 20 watt LED; LEDs and drivers as indicated on drawings.
 - d. Luminaire shall be equipped with lens guard.
10. Ceiling-Mounted Luminaires:
- a. Separate ceiling and reflector pans with foil-backed fiberglass between pans and 1/8 inch thick neoprene gasketing between ceiling pan and ceiling.
 - b. White polyester finished 18 gage cold-rolled steel back-plate with clear prismatic injection molded polycarbonate lens, UV stabilized heavy gage aluminum back-plate and four tamper-proof screws.
 - c. Provide luminaire wattage as indicated on drawings.
 - d. Luminaire shall be listed for damp locations.
11. Ceiling / Wall Mounted Luminaires:
- a. Luminaire shall be die-cast aluminum.

- b. Luminaire shall have reinforced four-point mounting system construction to resist breakage from impact and prying.
- c. Luminaire finish shall be as indicated on drawings.
- d. Lens shall be Injection molded UV stabilized, high impact resistant opal polycarbonate.
- e. Luminaire shall have option trim ring to fit between housing and inside lip of trim ring for a smooth transitional look.
- f. Provide luminaire with input watts as indicated on drawings.
- g. Ceiling luminaires shall be supplied without eye lid option, wall mounted luminaires shall be supplied with eye lid option.

12. Outdoor Wall-Mounted Luminaires (Vandal Resistant):

- a. Seamless, one-piece, injection molded polycarbonate lens/housing, 0.187 inch, UV stabilized polycarbonate lens. The wraparound lens design encloses and protects the interior of unit.
- b. Die cast aluminum mounting plate.
- c. One-piece, full size, closed cell neoprene rubber gasket.
- d. One stainless steel tamper-proof screw.
- e. Luminaire shall be UL listed for wet locations.
- f. Luminaires shall be provided with input watts as indicated on drawings.

13. Wall Mounted Full Cutoff Exterior Wall.

- a. Luminaire shall be mounted at no less than nine feet above finished grade, or as indicated in drawings.
- b. Housing shall be made of 20 gage die cast aluminum, and be equipped with hinged doors.
- c. Luminaire shall have Stainless steel tamperproof hardware.
- d. Luminaire shall be provided with input watts as indicated on drawings. Luminaire Optics shall be full 90 degree horizontal cutoff on all distributions. Reflector shall be specular aluminum. Luminaire shall have tempered glass lens with optional wire guard.

14. Wall-Mounted Luminaires (Vandal Resistant):

- a. One-piece prismatic refractor held by cast metal door, hinged to die-cast anodized aluminum weatherproof housing with visor to limit light pollution.
- b. Die-cast aluminum housing of 1/8 inch minimum wall thickness. Luminaire shall be provided with tamper-proof screws.
- c. High impact resistant, UV stabilized injection molded polycarbonate lense.
- d. High power LEDs.

2.4 EXIT ILLUMINATION

A. Lighting Luminaire:

1. Ceiling or wall-mounted, vandal-resistant type, LED EXIT, consisting of:
 - a. LED board, green exit lettering and directional arrows as indicated on drawings.
 - b. Face plate and polycarbonate shield.
 - c. Number of faces, voltage, and emergency power source shall conform to design requirements indicated on drawings.
 - d. Area of refuge listing is required when luminaires are used in such locations.
 - e. Utilize a flag mount luminary with additional support from the ceiling or wall for canopy or pendant mounted exit signs. This option shall be exercised only if a wall is not available.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install a lighting luminaire for each lighting outlet indicated and label with day of installation.
- B. Luminaire voltage shall be as indicated on Drawings.
- C. Install recessed and surface-mounted luminaires, with plaster frames compatible with ceiling and wall systems employed; secure luminaires mechanically to frames.
- D. Align rows of suspended and surface-mounted luminaires to form straight lines at uniform elevations.
- E. Recessed luminaires shall fit snugly against ceilings to prevent light leakage.
- F. Luminaire installations shall comply with CBC Seismic requirements
- G. Support suspended recessed luminaires in T-bar ceilings as follows: Luminaires shall be attached to ceiling grid to resist a horizontal force equal to weight of luminaires. For heavy-duty grid systems, luminaires weighing less than 56 pounds must also have two 12 gage slack safety wires from diagonal corners to the structure above; luminaires weighing more than 56 pounds shall be independently supported by not less than four taut 12 gage wires capable of supporting four times the load. For intermediate duty grid systems, luminaires shall be independently supported by not less than four taut 12 gage wires capable of supporting four times the load. Luminaire hanger wire ends shall be twisted three tight turns within a 1 ½ -inch distance. Provide positive point of

attachment to T-bar ceiling with four, #8 wafer head tek screws (one at each corner), avoiding conflict with operation of the lens. Luminaire installation shall be coordinated with acoustical ceiling installation.

- H. Emergency light luminaires shall be labeled "Emergency Luminaire" with one inch high letters produced with a P-touch or similar labeling system.
- I. Continuous suspended luminaires:
 - 1. Luminaire suspension device shall allow vertical adjustment of luminaire without the use of tools. Cable shall be minimum seven strand twisted stainless steel capable of supporting minimum four times the luminaire weight. For continuous linear suspended luminaires longer than eight feet, provide not less than three suspension points.
 - 2. Top of luminaire shall be suspended as shown on the Drawings, typically 24 inches below the ceiling and a minimum of 18 inches from the ceiling.
 - 3. Luminaire shall utilize factory furnished or approved hardware and canopy for either hard or T-bar ceilings.
 - 4. White Board Lights shall be suspended 24 inches from the wall unless specifically shown otherwise.
- J. Surface mount luminaires shall be attached to structure. Toggle bolts are NOT permitted. Provide backing where required.
- K. Low level exit signs shall be installed with the bottom of the sign not less than six inches, or more than eight inches above the floor level and shall indicate the path of exit travel. For exit and exit-access doors, the sign shall be on the door or adjacent to the door with the closest edge of the sign within four inches of the door frame.

3.2 TESTING

- A. Check and adjust luminaires for required illumination.
- B. Replace defective LED strips and drivers.
- C. Test and adjust lighting control equipment for proper operation.

3.3 SPARE PARTS

- A. Furnish ten percent spare LED strips with a minimum of one spare strip of each type.
- B. Furnish ten percent spare motion detectors of each type with a minimum of one spare detector of each type.

- C. Furnish ten percent spare drivers of each type with a minimum one spare driver of each type.

3.4 HAZARDOUS WASTE DISPOSAL

- A. Hazardous waste disposals shall be handled and disposed of by an approved, licensed contractor.
- B. Products with PCBs are not acceptable. Hazardous waste shall be placed in appropriate containers provided by hazardous waste contractor labeled clearly with:
 - 1. Project Name
 - 2. Quantity of materials
 - 3. Date materials became waste
- C. Store, remove, transport and dispose of hazardous materials in accordance with state and federal regulations.
- D. Provide Owner with copy of manifest and certificate of destruction.

3.5 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.6 CLEANUP

- A. Remove rubbish, debris, and waste materials from all areas of work each day.
- B. Clean luminaire surfaces of dirt, cement, plaster and debris. Furnish cleansers compatible with material surfaces being cleaned.

END OF SECTION 26 51 00

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 13800 - Building Automation and Control.
- B. Section 21 00 00 - Fire Suppression.
- C. Section 27 15 00 - Fire Alarm Communications Horizontal Cabling.

1.2 DESCRIPTION: (EXISTING)

- A. The existing fire alarm system complies with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- B. The fire alarm system shall be manufactured by an ISO 9001:2008 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
- C. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof). It's acceptable for peripheral devices to be manufactured outside of the U.S. by a division of the U.S. based parent company.
- D. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- E. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.3 VOICE PANEL DESCRIPTION:

- A. The voice evacuation panel shall comply with NFPA 72, Chapter 24 requirements.
- B. The Voice Evacuation Control Panel shall be UL 864 listed (Fire Protective Signaling), UL 2572 listed (Mass Notification), ULC listed and Compliant with Unified Facilities Criteria UFC 4-021-01.
- C. The installing company shall employ factory-certified NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.4 GUARANTY:

- A. The fire alarm control panel, voice panels and any head-end equipment shall have a manufacturer's warranty of a minimum of 3 years.

1.5 POST CONTRACT MAINTENANCE:

- A. Complete maintenance and repair service for the fire and gas detection system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, required tests, and list pricing for any replacement products included on the bill of materials, along with the list pricing for products not on the bill of materials; if test and inspection rates are different than full service rates the bid/proposal shall include pricing for all levels for a minimum period of five (5) years. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
- C. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

1.6 APPLICABLE STANDARDS AND SPECIFICATIONS:

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.
- B. National Fire Protection Association (NFPA) - USA:

No. 12	Extinguishing Systems (low and high)
No. 12A	Halon 1301 Extinguishing Systems
No. 13	Sprinkler Systems
No. 15	Water Spray Systems
No. 16	Foam / Water Deluge and Spray Systems
No. 17	Dry Chemical Extinguishing Systems
No. 17A	Wet Chemical Extinguishing Systems

No. 2001	Clean Agent Extinguishing Systems
No. 72	National Fire Alarm Code
No. 70	National Electric Code
No. 90A	Air Conditioning Systems
No. 101	Life Safety Code

C. Underwriters Laboratories Inc. (UL) - USA:

No. 268	Smoke Detectors for Fire Protective Signaling Systems
No. 864	Control Units for Fire Protective Signaling Systems
No. 2572	Mass Notification Systems
No. 217	Smoke Detectors, Single and Multiple Station
No. 228	Door Closers - Holders for Fire Protective Signaling Systems
No. 268A	Smoke Detectors for Duct Applications
No. 521	Heat Detectors for Fire Protective Signaling Systems
No. 464	Audible Signaling Appliances
No. 38	Manually Actuated Signaling Boxes
No. 1481	Power Supplies for Fire Protective Signaling Systems
No. 346	Waterflow Indicators for Fire Protective Signaling Systems
No. 1076	Control Units for Burglar Alarm Proprietary Protective Signaling Systems
No. 1971	Visual Notification Appliances
No. 2017	Standard for General-Purpose Signaling Devices and Systems
No.60950	Safety of Information Technology Equipment

- D. Local and State Building Codes.
- E. All requirements of the Authority Having Jurisdiction (AHJ).

1.7 APPROVALS:

- A. The system shall have proper listing and / or approval from the following nationally recognized or regional agencies:

UL	Underwriters Laboratories, Inc
ULC	Underwriters Laboratories Canada
FM	Factory Mutual
NYFD	New York Fire Department
CSFM	California State Fire Marshal

- B. The system shall be approved for use in Marine applications by the following agencies.
 - 1. United States Coast Guard
 - 2. Lloyd's Register
 - 3. American Bureau of Shipping The system shall be listed by the national agencies as suitable for extinguishing release applications. The system shall support release of low pressure CO2.
- C. The system shall be certified for seismic applications in accordance with the International Building Code (IBC). For OSHPD applications in California the system shall be Pre-Approved for seismic applications. The basis for qualification of seismic approval shall be via shake table testing.

PART 2.0 PRODUCTS

2.1 Main Fire Alarm Control Panel or Network Node (Existing)

- A. Main FACP or network node shall be a NOTIFIER Model NFS-320 and shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

2.2 System Capacity and General Operation

- A. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels / nodes per network.
- B. Each network node shall provide, or be capable of 318 intelligent / addressable devices per SLC loop.
- C. The Notification Appliance Circuits shall be programmable to Synchronize with System Sensor, Gentex and Wheelock Notification Appliances.
- D. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire and gas detection system.
- E. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
- F. The system shall allow the programming of any input to activate any output or group of outputs. Systems that have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.
- G. The FACP shall support up to 20 logic equations, including "and," "or," and "not," or time delay equations to be used for advanced programming. Logic equations shall require the use of a PC with a software utility designed for programming.
- H. The FACP or each network node shall provide the following features:
 - 1. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
 - 2. Detector sensitivity test, meeting requirements of NFPA 72.
 - 3. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
 - 4. Up to nine sensitivity levels for alarm, selected by detector. The alarm level range shall be 0.5 to 2.35 percent per foot for photoelectric detectors, 0.5 to 2.5 percent per foot for ionization detectors, 0.5 to 4.0 percent per foot for acclimate detectors and 1.0 to 4.0 percent per foot for multi-criteria (IntelliQuad and IntelliQuad PLUS) detectors . The system shall also support

sensitive advanced detection laser detectors with an alarm level range of .02 percent per foot to 2.0 percent per foot. The system shall also include up to nine levels of Prealarm, selected by detector, to indicate impending alarms to maintenance personnel.

5. The ability to display or print system reports.
 6. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.
- I. PAS presignal, meeting NFPA 72 requirements.
1. Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.
 2. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
 3. Control-by-time for non-fire operations, with holiday schedules.
 4. Day / night automatic adjustment of detector sensitivity.
 5. Device blink control for sleeping areas.
- J. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Panel notification circuits (NAC 1,2,3 and 4) shall also support Two-Stage operation, Canadian Dual Stage (3 minutes) and Canadian Dual Stage (5 minutes). Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates. Canadian Dual stage is the same as Two-Stage except will only switch to second stage by activation of Drill Switch 3 or 5 minute timer. The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific "sync pulse."
- K. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download, and have the ability to upgrade the manufacturers (FLASH) system code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.
1. This utility shall provide the ability to create and print NFPA style Test and Inspection reports
 2. This utility shall provide the ability to create and print Device Maintenance

information

- L. The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
- M. Each FACP or FACP network node shall support one SLC. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric, multi-criteria, thermal, laser, fire/CO) and 159 intelligent modules (monitor, control, relay, releasing) for a loop capacity of 318 devices. SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.
- N. CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, pre-alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

2.3 Serial Interfaces

- A. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.
- B. EIA-232 interface shall be used to connect an UL-Listed 40 or 80 column printer. Printers that are not UL-Listed are not considered acceptable substitutes.
- C. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.
- D. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

2.4 Specific System Operations

- A. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
- B. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 0 to 60 seconds and each detector shall be able to be selected for verification. The FACP shall

keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

- C. Point Disable: Any addressable device may be enabled or disabled through the system keypad.
- D. Point Read: The system shall be able to display or print the following point status diagnostic functions:
 - 1. Device status
 - 2. Device type
 - 3. Custom device label
 - 4. View analog detector values
 - 5. Device zone assignments
- E. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
- F. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
- G. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.
- H. Software Zones: The FACP shall support 142 independent programmable software zones.

- I. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.
 - J. Mass Notification Override: The system shall be UL 2572 listed for Mass Notification and shall be capable, based on the Risk Analysis, of being programmed so that Mass Notification/Emergency Communications events take precedence over fire alarm events.
 - K. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:
 - 1. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.
 - 2. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.
 - 3. All devices tested in walk test shall be recorded in the history buffer.
- 2.5 Conventional Aspirating Detection
- A. An optional air aspiration detection system shall be available.
 - B. The aspirating system shall support multiple sensitivity settings.
 - C. The aspirating system shall operate from 24 VDC.
 - D. The aspirating system shall provide alarm and trouble relays used to activate a fire alarm control panel.
- 2.6 Aspiration System Interface:
- A. The system shall be capable of supporting Interface Modules for integrating VESDA Aspiration detectors into SLC loop of the fire alarm control panel. The Interface Module shall support up to 19 aspiration detectors, each SLC loop shall support one interface module.
- 2.7 High Level Aspiration System Interface:
- A. The system shall be capable of supporting a High Level Interface for VESDA Aspirating Detection Systems. The interface shall support up to 100 detectors and allow the fire alarm network to monitor and control events on the aspiration system.
- 2.8 Communicators:

- A. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
- B. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.
- C. The UDACT shall be capable of transmitting events in 4+2, SIA, and Contact ID.
- D. Communication shall include vital system status such as:
 - 1. Independent Zone (Alarm, trouble, non-alarm, supervisory)
 - 2. Independent Addressable Device Status
 - 3. AC (Mains) Power Loss
 - 4. Low Battery and Earth Fault
 - 5. System Off Normal
 - 6. 12 and 24 Hour Test Signal
 - 7. Abnormal Test Signal (per UL requirements)
 - 8. EIA-485 Communications Failure
 - 9. Phone Line Failure
- E. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 3,064 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
- F. The UDACT shall be capable of being programmed with the same programming utility as the host FACP, and saved, edited and uploaded and downloaded using the utility. UDACT shall be capable of being programmed online or offline. The programming utility shall also support upgrading UDACT operating firmware.
- G. The UDACT shall be capable of generating Central Station reports providing detailed programming information for each point along with the central station point address.
- H. An IP or IP/GSM Communicator option shall be available to interface to the UDACT and be capable of transmitting signals over the internet/intranet or Cellular.

lar (GSM) network to a compatible receiver.

I. Smoke Control Annunciator

1. On/Auto/Off switches and status indicators (LEDS) shall be provided for monitoring and manual control of each fan, damper, HVAC control unit, stairwell pressurization fan, and smoke exhaust fan. To ensure compliance the units supplied shall meet the following UL categories: UUKL, PAZX, UDTZ, QVAX as well as the requirements of NFPA 90A, HVAC, and NFPA 92A & 92B, Smoke Control. The control System shall be field programmable for either 90A operation or 92A/B operation to allow for future use and system expansion.
2. The OFF LED shall be Yellow, the ON LED shall be green, the Trouble/Fault LED shall be Amber/Orange for each switch. The Trouble/Fault indicator shall indicate a trouble in the control and/or monitor points associated with that switch. In addition, each group of eight switches shall have two LEDS and one momentary switch which allow the following functions: An Amber LED to indicate an OFF-NORMAL switch position, in the ON or OFF position; A Green LED to indicate ALL AUTO switch position; A Local Acknowledge/Lamp Test momentary switch.
3. Each switch shall have the capability to monitor and control two addressable inputs and two addressable outputs. In all modes, the ON and OFF indicators shall continuously follow the device status not the switch position. Positive feedback shall be employed to verify correct operation of the device being controlled. Systems that indicate on/off/auto by physical switch position only are not acceptable.
4. All HVAC switches (i.e., limit switches, vane switches, etc.) shall be provided and installed by the HVAC contractor.
5. It shall be possible to meet the requirements mentioned above utilizing wall mounted custom graphic.

2.9 Gateway & Webserver Options

- A. Common Alerting Protocol (CAP) Gateway: The system shall support an optional CAP Gateway (Common Alerting Protocol). The CAP Gateway translates fire system messages to industry standard CAP messages for integration with CAP-compliant clients. A CAP gateway shall be available from the fire alarm control panel manufacturer.
- B. LEDSIGN Gateway: The system shall support an optional and proprietary LEDSIGN Gateway to interface to LED signs that will automatically display emergency messages. The signs shall be capable of storing up to 100 messages that can be activated via system programming with the ability to be manually overridden. The Sign Gateway shall support up to 10 independent signs, each sign capable of playing an independent message. Multiple LEDSIGN Gateways can be used

in network applications. An LEDSIGN gateway shall be available from the fire alarm control panel manufacturer.

- C. BACnet Interface Gateway: The system shall be capable of being interfaced with BACnet compliant clients. A BACnet interface supporting BACnet/IP communication shall be available from the fire alarm control panel manufacturer.
- D. MODbus Interface Gateway: The system shall be capable of being interfaced with MODbus compliant clients. A MODbus interface supporting MODbus/TCP communication shall be available from the fire alarm control panel manufacturer.
- E. Noti-Fire-Net Gateway: The system shall support an IP based gateway to enable the panel or local Noti-Fire-Net to be connected to an ONYXWorks workstation via the Internet or Intranet. This gateway shall also support the ability to integrate the system to an interactive firefighter's display. The Noti-Fire-Net Gateway shall be available from the fire alarm control manufacturer.
- F. Webserver: The system shall support a webserver allowing remote connection via the Internet or Intranet. Authorized users will have the ability to view panel/network history, event status and device properties. The webserver shall also support sending event information via email or text to up to 50 registered users, the webserver shall be available from the fire alarm control panel manufacturer.
- G. Web Portal Interface: The system shall be capable of being interfaced with a web portal to integrate with Inspection and Service Manager utilities. The web portal and inspection and service manager utilities shall be available from the fire alarm control panel manufacturer.

2.10 System Components & Addressable Devices

A. General

1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
2. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumina-

tion by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications. The system shall also support an intelligent programmable sounder base, the programmable sounder base shall be capable of providing multiple tones based on programming and at a minimum be capable of providing a Temp-4 tone for CO (Carbon Monoxide) activation and a Temp-3 tone for fire activations and be capable of being synchronized with other programmable sounder bases and common area notification appliances; 85 DBA minimum.
8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
11. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
13. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan

enclosure shall be available.

14. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status; NOTIFIER model # NBG-12LX They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. The key used to reset the pull station must be the same as the key used to lock and unlock the FACP door(s).
 15. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
 16. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
- B. Intelligent Photoelectric Smoke Detector: The intelligent photoelectric smoke detector shall be NOTIFIER model # FSP-851 and shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- C. Intelligent VIEW® Laser Photo Smoke Detector: The intelligent laser photo smoke detector shall be a spot type detector, NOTIFIER model # FSL-751, that incorporates an extremely bright laser diode and an integral lens that focuses the light beam to a very small volume near a receiving photo sensor. The scattering of smoke particles shall activate the photo sensor.
1. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.
 2. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.02 percent per foot.
 3. The laser detector shall not require expensive conduit, special fittings or PVC pipe.
 4. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.
 5. The laser photo detector shall not require other cleaning requirements than those listed in NFPA 72. Replacement, refurbishment or specialized cleaning of the detector head shall not be required.
 6. The laser photo detector shall include two bicolor LEDs that flash green in normal operation and turn on steady red in alarm.
- D. Intelligent Ionization Smoke Detector: The intelligent ionization smoke detector

shall be NOTIFIER model # FSI-851 and shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

- E. Intelligent Multi Criteria Acclimating Detector: The intelligent multi-criteria Acclimate® Plus™ detector shall be an addressable device, NOTIFIER model # FAPT-851, that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.
 - 1. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).
 - 2. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.
- F. Intelligent Thermal Detectors: The intelligent thermal detectors shall be NOTIFIER FST- series addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.
- G. Intelligent Duct Smoke Detector: The smoke detector housing shall accommodate an intelligent photoelectric detector that provides continuous analog monitoring and alarm verification from the panel. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system. The Intelligent Duct Smoke Detector shall support the installation of addressable Photoelectric detector capable or being tested remotely. The Intelligent Duct Detector housing shall be model # DNR(W) and the remote test capable photoelectric smoke detector shall be NOTIFIER model # FSP-851R.
- H. IntelliQuad™ Advanced Multi-Criteria Intelligent Detector

1. Intelligent multi-criteria fire detector shall be a NOTIFIER model number FSC-851. Smoke detector shall be an addressable intelligent multi-criteria smoke detector. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical carbon monoxide (CO) sensor, a daylight-filtered infrared sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
2. The intelligent multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in an effort to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The product design shall be capable of selecting the appropriate sensitivity levels based on the environment type chosen by user in which it is installed (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes.
3. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The device shall provide unique signals to indicate when 20% of the drift range is remaining, when 100% of drift range is used, and when there is a chamber fault to show unit requires maintenance.
4. The detector shall indicate CO trouble conditions including 6 months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self test failure, IR self test failure, and freeze warning.
5. The detectors shall provide address-setting means on the detector head using rotary switches. Because of the possibility of installation error, systems that use binary jumpers or DIP switches to set the detector address are not acceptable. The detectors shall also store an internal identifying code that the control panel shall use to identify the type of detector. Systems that require a special programmer to set the detector address (including temporary connection at the panel) are labor intensive and not acceptable. Each detector occupies any one of at least 99 possible addresses on the signaling line circuit (SLC) loop. It responds to regular polls from the system and reports its type and status.
6. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel. There are three test methods: functional magnet, smoke entry aerosol, or direct heat method.

7. The detectors shall provide two LEDs to provide 360° visibility. The LEDs are placed into steady red illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED, sounder base, and / or relay base (optional accessories). The external remote alarm can be interconnected to other sounder or relay bases for activating all devices in a space via a single alarming unit.
8. Two LEDs on the sensor are controlled by the panel to indicate sensor status. Coded signals, transmitted from the panel, can cause the LEDs to blink, latch on, or latch off. Refer to the control panel technical documentation for sensor LED status operation and expected delay to alarm.
9. The detectors shall be ceiling-mount and shall be plug-in mounted into a twist-lock base. These detectors shall be constructed of off-white UV resistant polymer and shall be detachable from the mounting base to simplify installation, service and maintenance. Mounting base wiring connections shall be made by means of SEMS screws. The detector shall allow pre-wiring of the base and the head shall be a plug-in type. Mounting base shall be mounted on junction box which is at least 1.5 inches (3.81 cm) deep. Mounting base shall be available to mount to standard junction boxes. Suitable boxes include:
 - a. 4.0" (10.16 cm) square box with and without plaster ring.
 - b. 4.0" (10.16 cm) octagonal box.
 - c. 3.5" (8.89 cm) octagonal box.
 - d. Single-gang box.
10. Meets Agency Standards
 - a. ANSI/UL 268 -Smoke Detectors for Fire Alarm Signaling Systems
 - b. CAN/ULC-S529- Smoke Detectors for Fire Alarm Systems
 - c. FM 3230-3250- Smoke Actuated Detectors for Automatic Fire Alarm Signaling
- I. IntelliQuad™ PLUS Advanced Multi-Criteria Intelligent Fire/CO Detector
 1. Advanced Multi-Criteria Fire/CO detector shall be NOTIFIER model # FCO-851 and shall be an addressable advanced multi-criteria smoke detector with a separate signal for carbon monoxide (CO) detection per UL 2075 standards.
 2. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical CO sen-

sor, a daylight-filtered infrared (IR) sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.

3. The advanced multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in order to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The detector shall be capable of selecting the appropriate sensitivity levels based on the environment type (office, manufacturing, kitchen, etc.) in which it is installed, and then have the ability to automatically change the setting as the environment changes.
4. The CO detector component shall be capable of a functional gas test using a canned test agent to test the functionality of the CO sensing cell.
5. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The device shall provide unique signals to indicate when 20 percent of the drift range is remaining, when 100 percent of drift range is used, and when there is a chamber fault to show the unit requires maintenance.
6. The detector shall indicate CO trouble conditions, including six months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self test failure, IR self test failure, and freeze warning.
7. The detector shall provide address-setting means on the detector head using rotary switches. Because of the possibility of installation error, systems that use binary jumpers or DIP switches to set the detector address are not acceptable. The detector shall also store an internal identifying code that the control panel shall use to identify the type of detector. Systems that require a special programmer to set the detector address (including temporary connection at the panel) are labor intensive and not acceptable. Each detector occupies any one of at least 159 possible addresses on the signaling line circuit (SLC) loop. It responds to regular polls from the system and reports its type and status.
8. The detector shall provide a test means whereby it will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel. There shall be four test methods: functional magnet, smoke entry aerosol, carbon monoxide aerosol or direct heat method.
9. The detector shall provide two LEDs to provide 360° visibility. The LEDs shall be placed into steady red illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be

provided in the base to connect an external remote alarm LED. The detector must be capable of connecting to a sounder base that provides both temporal 3 and temporal 4 patterns for fire and CO alarm.

10. Two LEDs on the sensor shall be controlled by the panel to indicate sensor status. Coded signals, transmitted from the panel, shall cause the LEDs to blink, latch on, or latch off. Refer to the control panel technical documentation for sensor LED status operation and expected delay to alarm.
11. The detector shall be plug-in mounted into a twist-lock base. The detector shall be constructed of off-white, UV-resistant polymer and shall be detachable from the mounting base to simplify installation, service and maintenance. Mounting base wiring connections shall be made by means of SEMS screws. The detector shall allow pre-wiring of the base and the head shall be a plug-in type. The mounting base shall be mounted on a junction box that is at least 1.5 inches (3.81 cm) deep. The mounting base shall be available to mount to standard junction boxes. Suitable boxes include:
 - a. 4.0" (10.16 cm) square box with and without plaster ring.
 - b. 4.0" (10.16 cm) octagonal box.
 - c. 3.5" (8.89 cm) octagonal box.
 - d. Single-gang box.
 - e. Double-gang box
12. Meets Agency Standards
 - a. ANSI/UL 268 -Smoke Detectors for Fire Alarm Signaling Systems
 - b. CAN/ULC-S529- Smoke Detectors for Fire Alarm Systems
 - c. FM 3230-3250- Smoke Actuated Detectors for Automatic Fire Alarm Signaling
 - d. UL 2075 – Gas and Vapor Detector and Sensors – Systems Connected
- J. Intelligent Addressable Aspiration Detector: The intelligent aspiration detector shall be NOTIFIER model # FSA-8000 an addressable aspiration detector that communicates directly with the fire alarm control panel via the SLC communication protocol, no modules or high level interfaces shall be required. The fire alarm control panel shall support up to thirty one intelligent aspiration detectors per SLC loop. The aspiration detector shall have dual source (blue LED and infra-red laser) optical smoke detection for a wide range of fire detection with enhanced immunity to nuisance particulates. The FACP shall be capable of monitoring and annunciating up to five smoke event thresholds and eleven trouble conditions. Each event threshold shall be capable of being assigned a discrete type ID at

the FACP.

- K. Intelligent Addressable Reflected Beam Detector: The intelligent single-ended reflected beam smoke detector shall connect with two wires to the fire alarm control panel signaling line circuit (SLC). The detectors shall consist of a transmitter/receiver unit and a reflector and shall send data to the panel representing the analog level of smoke density. The detector shall be capable of being tested remotely via a keyswitch; NOTIFIER model # FSB-200. Model # FSB-200S shall be equipped with an integral sensitivity test feature.

L. Addressable Dry Contact Monitor Module

- 1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs. The addressable monitor module shall be NOTIFIER model # FMM-1 (Class A or B) or FMM-101 (Class B)
- 2. The IDC zone shall be suitable for Style D/Class A or Style B/Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
- 3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
- 4. For multiple dry contact monitoring a module shall be available that provides 10 Style B or 5 Style D input circuits; NOTIFIER model # XP10-M.

M. Two Wire Detector Monitor Module

- 1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device); NOTIFIER model # FZM-1.
- 2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
- 3. For multiple 2-wire smoke detector circuit monitoring a module shall be available that provides 6 Style B/Class A or 3 Style D/Class B input circuits; NOTIFIER model # XP6-MA.

N. Addressable Control Module

- 1. Addressable control modules shall be provided to supervise and control the

operation of one conventional circuit of compatible Notification Appliances, 24 VDC powered, polarized audio/visual notification appliances; NOTIFIER model # FCM-1

2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with a current rating of 2 Amps for Style Z and 3 Amps for Style Y;
3. Audio/visual power shall be provided by a separate supervised circuit from the main fire alarm control panel or from a supervised UL listed remote supply.
4. For multiple circuit control a module shall be available that provides 6 Style Y (Class B) or 3 Style Z (Class A) control circuits; NOTIFIER model # XP6-C.

O. Addressable Releasing Control Module

1. An addressable FlashScan releasing module shall be available to supervise and control compatible releasing agent solenoids; NOTIFIER model # FCM-1-REL.
2. The module shall operate on a redundant protocol for added protection.
3. The module shall be configurable for Style Z or Style Y (Class A/B) and support one 24 volt or two 12 volt solenoids.

P. Addressable Relay Module:

1. Addressable Relay Modules shall be available for HVAC control and other network building functions; NOTIFIER model # FRM-1.
2. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.
3. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary devices energize at the same time on the same pair of wires.
4. For multiple relay control a module shall be available that provides 6 programmable Form-C relays; NOTIFIER model # XP6-R.

Q. Addressable Two-In / Two-Out Monitor/Relay Module:

1. An addressable Two-In / Two-Out module shall be available; NOTIFIER model # FDRM-1.
2. The two-in/two-out module shall provide two Class B/Style B dry-contact input circuits and two independent Form-C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.

- R. Isolator Module: Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building; NOTIFIER model # ISO-X.
1. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
 2. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
 3. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- S. Voice Evacuation Control Panel
1. The Voice Evacuation Control Panel shall be a NOTIFIER FirstCommand NFC-50/100 and shall contain a microprocessor-based Central Processing Unit (CPU). The CPU shall distribute and control emergency voice messages over the speaker circuits.
 2. The Voice Evacuation Control Panel shall be UL 864 listed (Fire Protective Signaling), UL 2572 listed (Mass Notification), ULC listed and Compliant with Unified Facilities Criteria UFC 4-021-01.
 3. The system shall provide the capability to interface to distributed voice evacuation control panels from the same manufacturer.
 4. The Voice Evacuation Control Panel shall be activated by the Fire Alarm Control Panel via a direct serial connection allowing the Fire Alarm Control panel to control speaker circuit(s) and message activation.
 5. Shall have as minimum requirements:
 - a. Integral 50 Watt, 25 Vrms audio amplifier with optional converter for 70.7-volt systems. The main system shall be capable of expansion to 100 watts total via the insertion of an additional 50 watt audio amplifier module into the same cabinet.
 - b. Speaker circuit that can be wired both Class A and / or B.
 6. Integral Digital Message Generator with a memory capacity for up to fourteen messages, each message shall be up 60 seconds long. These messages shall field programmable without the use of additional equipment.

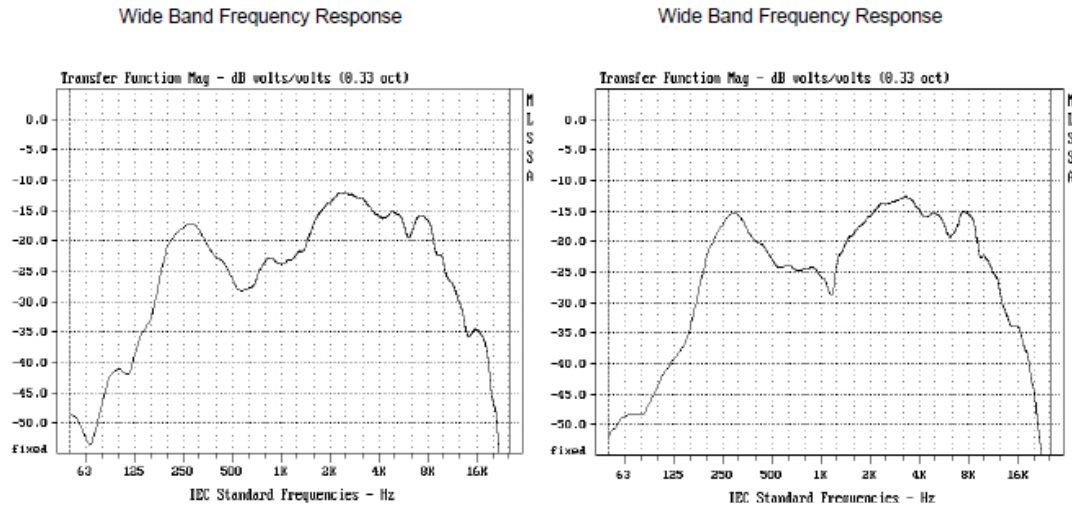
7. Built in alert tone generators with steady, slow whoop, high/low and chime tone field programmable.
8. The Voice Control Panel will be capable of detecting and annunciating the following conditions: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Microphone Trouble, Message Generator Trouble, Tone Generator Trouble, and Amplifier Fault.
9. The Voice Control Panel shall be fully supervised including microphone, amplifier output, message generator, speaker wiring, and tone generation.
10. Speaker outputs shall be fully power-limited.
11. Amplifiers will be supplied power independently to eliminate a short on one circuit from affecting other circuits.
12. The Voice Control Panel will provide full supervision on both active (alarm or music) and standby conditions.
13. Optional distributed amplifier units shall be available to increase total system capacity to up to 24 speaker circuits and up to 1,100 watts of power.

T. SpectrAlert Advance Speakers

1. The Speaker appliance shall be System Sensor SpectrAlert Advance model _____ Speaker. The speaker shall be listed to UL 1480 for Fire Protective Signaling Systems. It shall be a dual-voltage transformer speaker capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.
3. Speakers shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker design shall isolate speaker components to reduce ground fault incidents.
4. The speaker shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction.
5. All notification appliances shall be backward compatible.

Ceiling Speaker

Wall Speaker



Note: The wide band frequency response is derived using MLS methods

U. SpectrAlert Advance Speaker Strobes

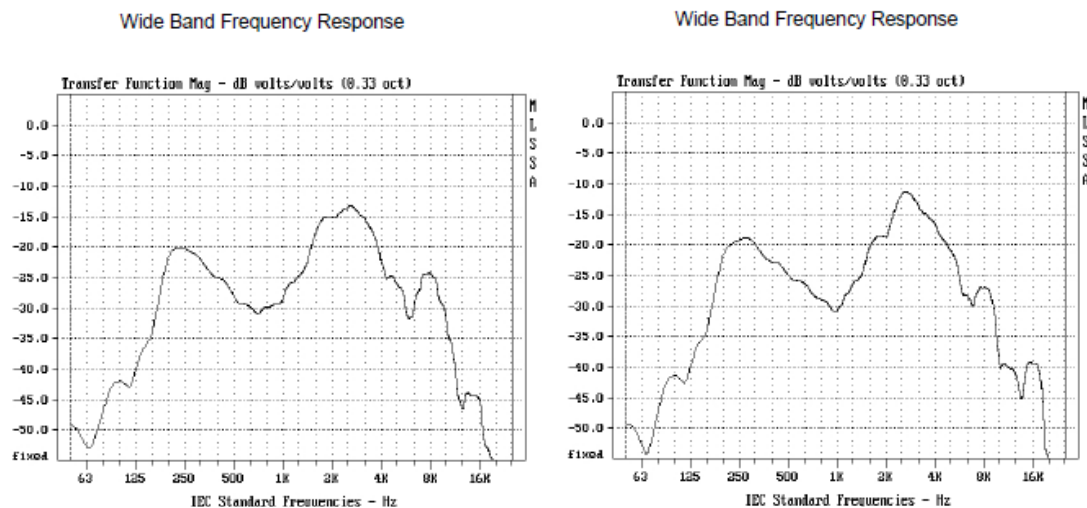
1. The Speaker Strobe appliance shall be System Sensor SpectrAlert Advance model ____ Speaker Strobe. The speaker strobe shall be listed to UL 1971 and UL 1480 and be approved for fire protective signaling systems. It shall be a dual-voltage transformer speaker strobe capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker strobe products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes and the Sync•Circuit™ Module MDL3 accessory, if used, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts (includes fire alarm panels with built in sync). When used with the Sync•Circuit Module MDL3, 12-volt rated notification appliance circuit outputs shall operate between 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 to 33 volts. If the notification appliances are not UL 9th edition listed with the corresponding panel or power supply being used, then refer to the compatibility listing of the panel to determine maximum devices on a circuit.
3. Speaker strobes shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker strobe design shall isolate speaker components to reduce ground fault incidents.
4. The speaker strobe shall have power taps (from 1/4 watt to 2 watts) and volt-

age that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12V or 24V. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12V and 15, 15/75, 30, 75, 110, or 115 when operating on 24V. The strobe shall comply with NFPA 72 and the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range.

5. All notification appliances shall be backward compatible.

Ceiling Speaker Strobe

Wall Speaker Strobe



Note: The wide band frequency response is derived using MLS methods

6. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and be fully synchronized.

PART 3.0 – EXECUTION

3.1 INSTALLATION:

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annun-

ciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

- D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST:

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72.

- A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- B. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- C. Verify activation of all waterflow switches.
- D. Open initiating device circuits and verify that the trouble signal actuates.
- E. Open and short signaling line circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that trouble signal actuates.
- G. Ground all circuits and verify response of trouble signals.
- H. Check presence and audibility of tone at all alarm notification devices.
- I. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
- J. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- K. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.
- L. When the system is equipped with a Voice Evacuation Control panel, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying voice messages.

3.3 FINAL INSPECTION:

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION:

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION 28 31 00

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. Asphaltic concrete paving.
- B. Patching existing pavement.
- C. Fill all cracks in existing paving.
- D. Surface sealer coats.
- E. Path to pedestrian areas shall comply with 11B - 302-1 and 11B - 303.

1.02 RELATED WORK

- A. Section 32 12 36.13 - Asphalt Pavement Seal Coat.
- B. Section 32 17 23.13 - Pavement Marking.

1.03 REFERENCES

- A. California Department of Transportation (CALTRANS), Division of Highways Standard Specifications, as last amended.
- B. Definitions: Paving and base Type designations.
 - 1. Type A: Areas taking automobile traffic.
 - 2. Type B: Areas taking bus and/or truck traffic and fire lanes.
 - 3. Type C: Areas taking pedestrian traffic (hard-court/play areas).
 - 4. Type E: Areas where paving is to be replaced. Refer to 3.06.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with CALTRANS Standard Specifications.
- B. Off-site work to conform to local governing agency requirements. Obtain and pay for required permits and licenses. Do required testing.
- C. Allowable Tolerances:
 - 1. Material Weights: Weights of base course and paving materials delivered to Site shall be computed as follows:
 - a. Asphalt Concrete Paving: 12 lbs/sf/inch of thickness.
 - b. Rock Base Course: 9-1/2 lbs/sf/inch of thickness.
 - 2. Paving Surface Smoothness: 3/8" maximum permissible from a true plane measured from 10' straight edge placed on surface non-cumulative.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

1.05 SUBMITTALS

- A. Submit product data.
- B. Submit test reports of field quality control tests.
- C. Submit Weighmaster's Certificates showing net weight of each load of base and paving materials.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Place asphalt when base surface temperature is above 40°F and dry, and when weather is stable.
- B. Do not commence work until installation of underground pipes and utilities is complete.

1.07 GUARANTEE

- A. In addition to guarantee specified in Contract Close-Out, Section 01700, the Contractor shall repair or restore to first class condition any portion of asphaltic paving and surface coating in which weed growth, creeping, shoving, cracking, delamination, raveling, softening, excessive or uneven settlement due to improperly compacted subgrade, or other defects due to improper placing or defective materials, become apparent within one (1) year from acceptance date by the District.
- B. Effectiveness of type of weed control is sole responsibility of the Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Weed Control:
 - 1. Herbicide: Only use of borates, sodium chlorate, or other nonpoisonous chemicals will be permitted.
 - 2. Option: The Contractor may, at his option and expense, use Nox-Weed 310 emulsion.
- B. Base Course: Untreated rock using a pit run unwashed stream bar material, crusher run material, or blend of commercial products; graded as follows:
 - 1. Class 2 Aggregate Base, per Section 26, CALTRANS Standard Specifications.
 - 2. Mixing: Thoroughly blend material by blading or other suitable means.
- C. Asphalt Concrete Paving:
 - 1. General: CALTRANS Standard Specifications, except as modified herein.
 - 2. Asphalt: 40 or 50 penetration.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

3. Aggregate: Graded mix as follows:

TOTAL PERCENTAGE PASSING SIEVES

<u>Sieve Size</u>	<u>Percentage</u>
3/4"	100%
1/2"	90%-100%
3/8"	74%-89%
No. 4	53%-67%
No. 8	40%-50%
No. 30	20%-30%
No. 200	3%-8%
Paving Asphalt	5-1/2 % to 7% by weight of total mix.

4. Mixing: Plant mix aggregate and asphalt, to produce a dense mixture with minimum of voids, per Section 39, CALTRANS Standard Specifications.
- D. Surface Seal Coat For All Paving Areas:
1. Meet Green Book, Specification No. 203-9-Seal Coat Asphalt Base.
 2. Sealer shall be Ove Kote Asphalt Pavement Coating by Diversified Asphalt Products or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Subgrade Preparation: After areas are brought to approximate required subgrade, finish by scarifying to depth of 3", moistening and rolling with a self-propelled tandem roller, weighting 8 tons minimum, until surface is firm and unyielding. Bring any depressions and high areas to required grade by scarifying, filling or cutting, and rolling to density and stability of adjoining material.
- B. Weed Control: Just prior to paving work, apply herbicide to earth as per manufacturer's printed recommendations.
- C. Coat surfaces of manhole catch basin metal surface frames with oil to prevent bond with asphalt paving.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

3.03 INSTALLATION - BASE COURSE

- A. Spread to uniform thickness; water and roll until firm enough to support material trucks without displacement or rutting.
- B. Compacted Thicknesses:
 - 1. Type A Areas: 7." Parking lots.
 - 2. Type B Areas: 12". Fire Lane.
 - 3. Type C Areas: 3". Sidewalk/Hardcourt
 - 4. Type E Areas: 3" minimum. Paving Replacement refer to Paragraph 3.06.
- C. Density Required: 90% minimum.

3.04 INSTALLATION - PAVEMENT WEARING COURSE

- A. General: Conform to Section 39, CALTRANS Standard Specifications.
- B. Placing: Spread to headers and/or temporary screeds, where required, with Barber-Greene self-propelled mechanical spreading and finishing equipment, or Architect-approved equal. Hand spread only in places inaccessible to mechanical spreader. Heat shovels, forks and rakes.
- C. Edges: At headers, lay to a thickness 4" deep x 8" wide at bottom, forming a footing. Slope bottom up 3:1 to meet typical paving thickness. Where paving stops against buildings, walls, curbs, or concrete walks, thickened edges are not required.
- D. Abutting Work: Where paving contacts rigid structures, thoroughly clean and coat contact surfaces with a film of asphalt emulsion and/or asphalt cement. Protect adjoining work from spotting and splashing or asphalt materials.
- E. Rolling and Smoothness: Roll per Section 39, CALTRANS Standard Specifications. Finished surface to be even, smooth, of uniform texture free of roller welts, true to place and line, and drain as indicated. Paving to have a density such that water will not penetrate.
- F. Compacted Paving Thicknesses:
 - 1. Type A Areas: 3". Parking Lot
 - 2. Type B Areas: 3.5". Fire Lane
 - 3. Type C Areas: 3" Sidewalk/Hardcourt.
 - 4. Type E Areas: 3" minimum. Paving replacement refer to Paragraph 3.06.

3.05 APPLICATION - SURFACE SEAL

- A. Refer to Specification Section 32 12 36.13, Asphalt Pavement Seal Coat/Crack Filler.
- B. Preparation:
 - 1. Clean paving surface removing all loose, foreign materials.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

2. Contractor shall exercise one of the following procedures:
 - a. Remove existing concrete parking bumpers prior to seal coat application and replace all bumpers on the original manner after curing period.
 - b. Mask all bumpers completely to prevent seal coat from splashing onto bumpers.
 3. Preventive measures shall be taken to protect existing concrete surfaces including curbs, walks, light pole mounting piers, etc, from over-splash by seal coat.
- C. Application:
1. Per manufacturer's recommendations.
 2. Mix into a slurry with three to six lbs. of sand per gallon of sealer.
 3. Protect adjacent structures from mixture.
 4. **Apply evenly in two coats.** Spread immediately with rubber-faced squeegees; pull at angle from line of spread, to roll material toward operator. After each coat has dried, remove ridges with scraper.
 5. Total Application Rate for Two Coats: Apply at an undiluted rate of 25 gallons minimum per 1,000 square feet. Increase application rate due to surface porosity per manufacturer's printed recommendations.
- D. Protect from traffic for three (3) days minimum after application.

3.06 TYPE E ASPHALT - PAVING REPLACEMENT

- A. Establish subgrade elevations allowing for new asphalt layers.
- B. Rip established subgrade surface to depth to 10 - 12" and bring to optimum moisture content and compact to 95% minimum.
- C. Prepare and sterilize new surface per CALTRANS Standards.
- D. Place two lifts of hot asphalt for a finished thickness of 3" at hardcourt and 3.5" at fire lane. Top lift to be 3/8" fine asphalt paving 1-1/2" thick, lower lift 1/2" maximum, medium asphalt paving 2-1/2" thick. Place, compact, and test per current Caltrans Standards.
- E. Apply (2) application of seal coat over all paving.

3.07 FIELD QUALITY CONTROL

- A. On-Site Work:
 1. Water Test: Flood test paving to show surfaces are free of standing puddles, and drain properly.
 2. Material Tests:
 - a. Made at District's option, by District selected Testing Lab.
 - b. District's Inspector to select test sample locations.
 - c. The Contractor is to repair test areas at no additional cost to District.
 - d. Testing costs by Contractor.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

3.08 CLEANING

Remove equipment, excess materials, debris, and material splashes from abutting work.

3.09 REPAIR EXISTING CRACKS:

- A. Less than 1/4" up to 1/2": Repair with OverKote, Crack Filler by Diversified Asphalt Products or approved equal.
- B. Greater than 1/2" but less than 1": Remove asphalt a minimum of 2" down or to sound pavement and re-pack area with asphalt paving mix following procedures under paragraph 3.06.
- C. Greater than 1": Follow procedures under paragraph 3.06.

3.10 PATCHING EXISTING PAVEMENT

- A. Remove any defective pavement and existing deteriorated in areas defined and all pavement disturbed by construction activity to minimum 6" in depth or until sound subgrade is obtained. Extend limits minimum 1' into sound pavement; make cuts in straight lines.
- B. Contractor to remove spoils from site and dispose of properly.
- C. Apply tack coat to sides and bottom of excavated areas.
- D. Place asphaltic concrete in maximum 4" high lifts thoroughly and evenly compact using equipment which will obtain maximum compaction without damage to surrounding pavement.
- E. Contour and blend patches to lines and elevations of adjacent surfaces.
- F. Determine location of "bird baths". Apply tack coat and blend new leveling asphalt to existing surface.
- G. Repairing Existing Cracks:
 - 1. Less than 1/4" up to 1/2": Repair with OverKote, Crack Filler by Diversified Asphalt Products or approved equal.
 - 2. Greater than 1/2" but less than 1": Remove asphalt a minimum of 2" down or to sound pavement and re-pack area with asphalt paving mix following procedures under Paragraph 3.06.
 - 3. Greater than 1": Follow procedure under Paragraph 3.06.
- H. Apply 2 applications of seal coat 2 days apart over entire surface and re-stripe.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. All new and existing asphalt pavement areas as indicated in the Drawings is to be seal coated.
- B. All existing asphalt pavement areas to receive seal coat as indicated in the Drawings is to have all cracks filled prior to seal coats.

1.02 RELATED SECTION

- A. Section 32 12 16.08 - Asphaltic Concrete Paving, Patching and Replacement.
- B. Section 32 17 23.13 - Pavement Marking.

1.03 QUALITY ASSURANCE

- A. Qualification of workmen:
 - 1. Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the design and application of work described for this section, and who shall be present at all times during progress of the work of this section and shall direct all work performed under this section.
 - 2. For actual seal coating and operation of the required equipment, use only personnel who are thoroughly trained and experienced in the skills required.

PART 2 - PRODUCTS

2.01 SEAL COAT

- A. The surface Seal Coat of existing and new Asphalt Pavement shall meet Green Book, Specification No. 203-9 Seal Coat Asphalt Based.
- B. Over Kote Asphalt Pavement Coating, Over Kote 1 Crack Filler and Over Kote Crack Filler 2 by Reed & Graham, Inc. or approved equal.

2.02 CRACK FILLER

- A. Over Kote Asphalt Pavement Coating, Over Kote Crack Filler and Over Kote Crack Filler II by Reed & Graham, Inc. or approved equal.

2.03 OTHER MATERIALS

All other materials, not specifically described but required for proper and complete installation of pavement seal coat, shall be provided to complete the work of this section.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Inspection: Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 1. Verify that seal coat may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
- B. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Architect.
 - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- C. New and existing Asphalt Paving:
 - 1. The surface shall be cleaned of all dirt, debris oil, or foreign matter. After thoroughly cleaning, dampen the surface with water. Remove any excess water prior to application of sealer. Rough or irregular areas are to be treated with a mastic mix consisting of two pounds of 30 mesh silica sand per gallon of seal coat, prior to the applications of seal coats.
- D. Repairing Existing Cracks:
 - 1. Less than 1/4" fill with Over Kote 1, Crack Filler by Reed & Graham, Inc. or approved equal.
 - 2. Greater than 1/4" but less than 1/2" fill with Over Kote, Crack Filler 2 by Reed & Graham, Inc. or approved equal.
 - 3. Greater than 1/2" but less than 1". Remove asphalt a minimum of 2" down or to sound pavement and re-pack area with asphalt paving mix following procedures under Section 32 12 16.08, Paragraph 3.06.
 - 4. Greater than 1". Follow procedure under Section 32 12 16.08, Paragraph 3.06.
- E. New Asphalt Paving is not to be seal coated for a minimum of 36 days after installation of asphalt, to allow new paving to cure and prevent slurry seal blistering.

3.02 APPLICATION

- A. Seal coat shall be a two-coat application, each at the rate of approximately 25 gallons per 1000 square feet of pavement for application of each coat at 3 mils minimum thickness. Application may be made with squeegees, brooms, or mechanical applicators designed for applying slurry seal. Application is to be made by experienced technicians. Finished surface shall be smooth, without ridges, loops, and holidays.
- B. Apply per manufacturer recommended procedure.

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- C. Do not place seal coat when the atmospheric temperature is below 65°F, or during unsuitable weather.
- D. Provide **two (2)** applications of seal coats on both new and existing asphalt surface as indicated on the Drawings. Coats shall be a minimum two (2) days apart.
- E. At new asphalt paving the Contractor shall be required to stripe parking lot areas where parking lot work is indicated, immediately after placement of asphalt. Contractor shall re-stripe a second time, 45 days later after application of seal coats.

3.03 CLEANING AND PROTECTION

- A. After completion of operations, clean surfaces of excess or spilled slurry material.
- B. Do not allow any foot or vehicular traffic on paving for 24 hours minimum, or until paving slurry has dried.
- C. Provide proper barricades and warning devices for slurry seal protection until it is opened to traffic.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Includes: Exterior warning surfaces at traffic walks; also denoted on drawings as truncated dome pavers, tiles or other industry standard nomenclature.
 - 1. Concrete recessed tile.
 - 2. Reinforced composite surface-mounted tile.
- B. Related Work:
 - 1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
 - 2. Portland Cement Concrete Paving: Section 32 13 13.

1.02 SUBSTITUTIONS

Only written approval of the Architect, by Addenda or Change Order, will permit substitutions for materials specified; in accordance with Article, Title 24, Part 2, CBSC, Section 01 25 13 Product Options and Substitutions.

1.03 QUALITY ASSURANCE

- A. Standards: In general, Work shall conform to latest edition of the following standards as applicable, and as modified herein.
 - 1. Installation: Tile Council of America, Handbook for Ceramic Tile Installation.
- B. Product shall comply with current California Building Standards Commission, Title 24, Part 12 CBSC, Chapters 12-11A and 12-11B, "Building and Facility Access Specifications".
- C. Warranty: Five (5) year warranty from the manufacturer stating that detectable warning products and directional surfaces shall ensure consistency and uniformity of the following:
 - 1. Shape
 - 2. Color Fastness
 - 3. Conformation
 - 4. Sound-on-cane acoustic equality
 - 5. Resilience
 - 6. Attachment will not degrade significantly for at least 5 years. Significant degradation shall mean that the product maintains at least 90% of its approved design characteristics.
- D. Detectable warning surfaces shall comply with CBC Section 11B-705.1.
- E. Detectable warning surfaces at transit boarding platform edges, bus stop, hazardous vehicular areas, reflecting pools and track crossings shall be yellow and approximate FS 33538 of Federal Standard 595C. Detectable surfaces at other locations shall be either the aforementioned yellow or a color providing a 70 percent minimum visual contrast with that of adjacent walking surfaces.

DETECTABLE/TACTILE WARNING SURFACES

The material used to provide visual contrast shall be an integral part of the surface. CBC Section 11B-705.1.1.3.

- F. Detectable warning surfaces shall differ from adjoining surfaces in saliency or sound-on-cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands or cut-through medians. CBC Section 11B-705.1.1.4.

1.04 SUBMITTALS

- A. Samples in duplicate: Manufacturer's standard color range.
- B. Warranties: Manufacturer's standard warranty (5 year warranty). See requirements under 1.03, Quality Assurance of this Section.
- C. Manufacturers: Recommended installation instructions.
- D. Shop Drawings: Showing plans of tile placement including joints for each installation location, type used.
- E. Material: Test reports.
- F. Maintenance Instructions.

1.05 DELIVERY, STORAGE AND HANDLING

Deliver tile to Site in sealed containers with grade seals intact. Store materials in a dry location.

1.06 PROJECT CONDITIONS

- A. Coordinate this work with work and backing furnished under other Specifications Sections.
- B. Placement of tactile surfaces shall coincide with concrete curb ramps and concrete paving leading to a vehicular traffic lane pedestrian crossing.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Recessed Concrete Tile: Conform to Americans with Disabilities Act and CBC Section 11B-705 (Part 2, Title 24), latest edition. Tile to be standard grade; manufactured by Wausau Tile, Inc., Wausau, WI; 800-388-8728, or approved equivalent.
 - 1. Other Acceptable Manufacturers:
 - a. ADA Solutions Inc.; 800-372-0519.

B. Materials:

1. Concrete Tile Size:
 - a. Nominal: 12" square.
 - b. Actual: 11-13/16"
2. Thickness: 2-3/4"
3. Weight: 24 to 32-1/2 lbs./sq. ft.
4. Dimensional Tolerance: +/- 1/16" (length, width, height, convex, and concave).
5. Color: As selected by Architect from manufacturer's full range of colors and patterns.
6. Pattern: ADA-2 Truncated Dome, 5 domes each side of tile.
 - a. Spacing: 2.3" to 2.4" nominal center of domes in both directions.
 - b. Dome diameter to be 0.9" to 0.92" at base and 0.45" to 0.47" at top of dome.
 - c. Height of dome: 0.18" to 0.22"
7. Minimum physical properties of the detectable/tactile surfaces:
 - a. Compressive Strength - ASTM C140/C140M-13 equal to or greater than 8,000 psi.
 - b. Flexural Strength - ASTM C293/C293M-10 equal to or greater than 800 psi average.
 - c. Water Absorption - ASTM C140/C140M-13a less than 6%.
 - d. Freeze/Thaw: ASTM C67-13 equal or less than 1% loss of dry weight (50 cycles)
 - e. Center Load: WTCL99 = 1,850 pounds
 - f. Warranty: See 1.03 B and C of this section.

C. Setting Bed (for thick mortar method):

1. 8" to 12" compacted road grade gravel (#6), sub-base.
2. 6" to 8" concrete base.
3. 1-1/4" thick latex mortar bed with 2" x 2" - 16/16 welded galvanized wire mesh reinforcing per manufacturer's requirements.
4. Portland cement mortar mix: ASTM C150/C150M-12, Laticrete 226, thick bed mortar with #3701 Admix, or manufacturer approved equivalent.
5. Slurry Bond Coats: Laticrete International 4237 bond coat or approved equivalent per manufacturer's approved recommendations. Provide slurry bond coat beneath and above mortar bed. A 100% bond between tile and setting bed is required. To achieve this, the "back butter" method and a 3/8" x 1/2" notched trowel shall be used per manufacturer's instructions.
6. Grout: All joints shall be grouted using a latex or acrylic admixture for waterproofing. The use recommendations of the admixture manufacturer must be followed.
7. Cementitious Materials:
 - a. Portland cement conforming to ASTM C150/C150M-12 for Portland cement.
 - b. Aggregates conforming to ASTM C33/C33M-13 for normal weight concrete aggregate.

2.02 MATERIALS

- A. Surface-Mounted Tile: Conform to Americans with Disabilities Act and CBC Section 11B-705 (Part 2, Title 24), latest edition. Tile to be standard grade; manufactured by ADA Solutions Inc., 800-372-0519, or approved equivalent.
 - 1. Other Acceptable Manufacturers:
 - a. ARMOR-TILE; 800-682-2525.
- B. Materials:
 - 1. Tile Size:
 - a. 24" x 36", 24" x 48", 24" x 60", 36" x 48" and 36" x 60"
 - b. Combination as required by the Drawings.
 - c. Beveled edges.
 - 2. Thickness: 3/16"
 - 3. Material: Exterior grade homogenous glass, carbon, and reinforced composite material with colorfast UV stabilizer.
 - 4. Dimensional Tolerance: +/- 1/16" (length, width, height, convex, and concave).
 - 5. Color: Yellow unless noted otherwise on Drawings.
 - 6. Pattern: ADA-2 Truncated Dome, 5 domes each side of tile.
 - a. Spacing: 2.3" to 2.4" nominal center of domes in both directions.
 - b. Dome diameter to be 0.9" to 0.92" at base and 0.45" to 0.47" at top of dome.
 - c. Height of dome: 0.18" to 0.22"
 - 7. Minimum physical properties of the detectable/tactile surfaces:
 - a. Compressive Strength - ASTM D 695 equal to or greater than 28,900 psi.
 - b. Flexural Strength - ASTM 790 D 790 equal to or greater than 29,300 psi.
 - c. Water Absorption - ASTM D 570 less than .07%.
 - d. Freeze/Thaw: ASTM C 1026, no disintegration
 - e. Load Bearing @ 16,000 lbs.: AASHTO-H20, no damage
 - f. Slip Resistant: ASTM C 1028 1.18 dry, 1.05 wet
 - g. Warranty: See 1.03 B and C of this section.

C. Installation:

1. Installation per manufacturer's recommendation.
2. Tiles to be installed with adhesive, stainless steel fasteners and edge sealed.
3. Fasteners: 1/4" x 1 5/8" composite sleeve anchor with stainless-steel pins.
4. Adhesive: One component structural elastic adhesive.
5. Sealant: BASF NP1, Silkaflex.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine newly poured concrete surfaces scheduled to receive tactile tile work. Report any unsatisfactory conditions.
- B. Do not start work until unsatisfactory conditions are corrected. Starting work constitutes acceptance of surfaces. Refer to manufacturer's recommendations.

3.02 INSTALLATION - GENERAL

- A. Tile Placement: By skilled mechanics and in accordance with the applicable provisions of the manufacturer's installation recommendations for cast-in-place or surface-mounted tiles.
- B. Install Portland Cement paving in accordance with Section 32 13 13, Portland Cement Concrete Paving.
- C. Place tiles and set per manufacturer's recommendations in a single plane, 1:12 maximum slope, flush with surrounding paved surfaces. The tile shall have a 2' minimum dimension in the direction of travel perpendicular to the traffic lane being crossed. Arrange tile pattern to allow in-line approach by wheelchairs.
- D. Tiles shall be placed after poured concrete ramp/walk mix is placed and screeded to the desired slope.
- E. Work tiles into concrete mix to the desired level flush with adjacent surfaces before finishing adjacent surfaces. Place 2 each 25 lb weights on each tile to ensure solid contact with concrete on the underside of the tile.

3.03 CLEANING

- A. Protection: Protect finish and surface of tile and adjacent materials with Vaseline to prevent staining.
- B. Cleaning: Upon completion of any portion of tile work, remove rubbish and unused materials incidental to the installation, and give the finished surfaces a thorough cleaning in a manufacturer-approved manner. Remove traces of cement and dust accumulations. Do not use acid solutions on tactile tile work.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Traffic lines and markings.
 - 2. Paint.
 - 3. Glass beads.
- B. Provisions of Division 1 to apply to this section.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.
- B. ASTM International:
 - 1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
 - 2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
 - 3. ASTM D562 - Standard Test Method for Consistency of Paints Using the Stormer Viscometer.
 - 4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
 - 5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
 - 6. ASTM D969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
 - 7. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
 - 8. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
 - 9. ASTM D1475 - Standard test Method for Density of Liquid Coatings, Inks, and Related Products.
 - 10. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
 - 11. ASTM D2202 - Standard Test Method for Slump of Sealants.
 - 12. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
 - 13. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.

14. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

- C. California Manual on Uniform Traffic Control Devices (CMUTCD).
- D. Standard Specifications for Public Works Construction (SSPWC).
- E. California Building Code, CBC 2019 11B.

1.3 PERFORMANCE REQUIREMENTS

- A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.
- B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.4 SUBMITTALS

- A. Product Data: Submit paint formulation for each type of paint.
- B. Samples:
 - 1. Submit eight (8) sample plates of each color of material. Prepare four (4) plates without glass beads and four (4) with glass beads for each different batch of material. After approval, Owner will retain these plates for field comparisons of applied paint.
 - 2. Submit two gallons and four one quart paint samples accompanied by properly executed test reports.
 - 3. Submit samples of glass bead in compliance with AASHTO M247.
- C. Test Reports: Submit source and acceptance test results in accordance with AASHTO M247.
- D. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Sustainable Design Requirements:
 - 1. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.
- B. Perform Work in accordance with SSPWC, CBC 2019 11B and the MUTCD.
- C. Maintain one (1) copy each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified

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in this section with minimum three (3) years documented experience.

- B. Applicator: Company specializing in performing work of this section with minimum three (3) years documented experience and approved by Architect/Engineer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.
- B. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
- C. Do not apply paint when temperatures are expected to fall below 50 degrees F for 24 hours after application.
- D. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.9 WARRANTY

- A. Furnish three (3) year manufacturer's warranty for traffic paints.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of traffic paints for three years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 PAINTED PARKING LOT/TRAFFIC PAVEMENT MARKINGS

- A. Manufacturers:
 - 1. Pervo Paint Company.
 - 2. Pathmark Traffic Products.
 - 3. Safety Coatings Inc.
 - 4. Franklin Paint Company.
 - 5. EZ-Liner Industries Model.
 - 6. Substitutions: Permitted with prior approval of Architect/Engineer.
- B. Furnish materials in accordance with SSPWC and the CMUTCD.
- C. Paint: Ready mixed, conventional and fast dry waterborne traffic paints, lead-free, non-toxic, NASSHTO Test Deck, minimum retroreflectance of 100 mcads, durability rating of 6 or more after in place for 9 months; within

following limits:

1. Pigment, percent by weight: 60 plus or minus 2.
 2. Vehicle, percent by weight: 40 plus or minus 2.
 3. Non-Volatile, percent by weight of paint: 76.0.
 4. Weight per gallon, pounds minimum 13.0.
 5. Viscosity: 80-95 Krieb Units at 77 degrees F.
 6. Grind (Hegeman Gauge), minimum Field Tested no tracking time under ambient conditions: 20-90 seconds.
 7. Dry Through Time, 15 mils wet at 90 percent relative humidity, 72 degrees F, ASTM D1640: 125 minutes maximum.
 8. VOC (Volatile Organic Content): One lbs/gal maximum.
- D. Glass Beads: AASHTO M247, Type 1, coated to enhance embedment and adherence with paint.

2.2 EQUIPMENT

- A. Continuous Longitudinal Line Application Machine: Use application equipment with following capabilities.
1. Dual nozzle paint gun to simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
 2. Pressurized bead-gun to automatically dispense glass beads onto painted surface, at required application rate.
 3. Measuring device to automatically and continuously measure length of each line placed, to nearest foot.
 4. Device to heat paint to approved temperature for fast dry applications.
- B. Machine Calibration:
1. Paint Line Measuring Device: Calibrate automatic line length gauges to maintain tolerance of plus or minus 25 feet per mile.
 2. Cycle Length/Paint Line Length Timer: Calibrate cycle length to maintain tolerance of plus or minus 6 inches per 40 feet; calibrate paint line length to maintain tolerance to plus or minus 3 inches per 10 feet.
 3. Paint Guns: Calibrate to simultaneously apply paint binder at uniform rates as specified with an allowable tolerance of plus or minus 1 mil.
 4. Bead Guns: Calibrate to dispense glass beads simultaneously at specified rate. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time. Verify weight of glass beads.
- C. Other Equipment:
1. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind strippers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

2.3 SOURCE QUALITY CONTROL

- A. Test and analyze traffic paints in accordance with these specifications.
- B. Make paints and glass beads available for inspection at manufacturer's factory prior to packaging for shipment. Notify Architect/Engineer at least seven days before inspection is allowed.
- C. Allow witnessing of factory inspections and test at manufacturer's test facility. Notify Architect/Engineer at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not apply paint to concrete surfaces until concrete has cured for 28 days, unless otherwise approved by Architect/Engineer.

3.2 PREPARATION

- A. Maintenance and Protection of Traffic:
 - 1. Provide short term traffic control in accordance with Section 01 50 00 - Temporary Facilities and Controls.
 - 2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.
 - 3. Maintain travel lanes between 7: 00 AM to 9: 00 AM, and between 4: 00 PM and 6: 00 PM. Unless otherwise approved by Architect/Engineer.
 - 4. Maintain access to existing businesses and other properties requiring access.
- B. Surface Preparation.
 - 1. Clean and dry paved surface prior to painting.
 - 2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.
 - 3. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center.
 - 4. Notify Architect/Engineer after placing pavement spots and minimum three (3) days prior to applying traffic lines.

3.3 EXISTING WORK

- A. Remove existing markings in an acceptable manner. Do not remove existing pavement markings by painting over with blank paint. Remove by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.
- B. Clean and repair existing remaining or reinstalled lines and legends.

3.4 APPLICATION

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- A. Agitate paint for 1-15 minutes prior to application to ensure even distribution of paint pigment.
- B. Dispense paint at approved temperature to wet-film thickness of 15 mils, except dispense edge markings to wet-film thickness of 12 mils.
- C. Apply glass beads at rate of six (6) pounds per gallon of paint.
- D. Apply markings to indicated dimensions at indicated locations.
- E. Prevent splattering and over spray when applying markings.
- F. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free. When vehicle crosses a marking and tracks it or when splattering or over spray occurs, eradicate affected marking and resultant tracking and apply new markings.
- G. Collect and legally dispose of residues from painting operations.
- H. Install Work in accordance with SSPWC and CMUTCD.

3.5 APPLICATION TOLERANCES

- A. Maximum Variation from Wet Film Thickness: 1 mil.
- B. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.
- C. Maintain cycle length for skip lines at tolerance of plus or minus six (6) inches per 40 feet and line length of plus or minus three (3) inches per 10 feet unless otherwise approved by Architect/Engineer.
- D. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F

3.6 FIELD QUALITY CONTROL

- A. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.
- B. Repair lines and markings, which after application and curing do not meet following criteria:
 - 1. Incorrect Location: Remove and replace incorrectly placed patterns.
 - 2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
 - 3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new

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markings on cleaned surface in accordance with this Section.

- C. Replace defective pavement markings as specified throughout a three (3) year warranted period. Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner's painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work. If this requirement is different in the Contract Documents, then the Contract Documents override this specification.
- D. A three member team will evaluate warranty provisions. Team will consist of one member from Owner, one member from Contractor, and third person who is mutually acceptable to Owner and Contractor. Any costs for third person will be equally shared between Owner and Contractor. At least once each year, beginning with year after acceptance, team shall:
 - 1. Observe Owner taking readings by retroreflectometer, or review Owner records of such evaluation. The number of readings will be as large as necessary to ensure that minimum criteria are satisfied. Readings will be during period from March 15 through October, when pavement is clean and dry.
 - 2. Determine color fade, discoloration or pigment loss based on visual color comparison between original sample plates with glass beads and in-place pavement markings.
 - 3. Determine magnitude of material loss.
- E. Prepare list of defective areas and areas requiring additional inspection and evaluation to decide where material may need replaced. Provide traffic control as necessary if markings require more detailed evaluation.
- F. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists during warranty period:
 - 1. Average retro-reflectivity within any 528 foot section is less than 1225 mcd/m²/1x for white pavement markings and 100 mcd/m²/1x for yellow pavement markings.
 - 2. Marking is discolored or exhibits pigment loss, and is determined to be unacceptable by three member team based on visual comparison with beaded color plates.
 - 3. More than 15 percent of area of continuous line, or more than 15 percent of combined area of skip lines, within any 528 foot section of roadway is missing.
- G. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original three (3) year period even when replacement materials have been installed as specified.
- H. When eradication of existing paint lines is necessary, eradicate by shot

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blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to requirements in Section 32 13 13.

- I. Maintain daily log showing work completed, results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.7 PROTECTION OF FINISHED WORK

- A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

3.8 SCHEDULES

- A. Pavement Markings: Use the following schedule unless otherwise specified in construction drawings.

Items	Location
4 inch White Conventional	Edge
4 inch White Fast Dry	Edge
24 inch White Fast Dry	Stop Line
4 inch Yellow Conventional	Center
4 inch Yellow Fast Dry	Center

END OF SECTION



SAN DIMAS HIGH SCHOOL

GYMNASIUM HVAC REPLACEMENT

BONITA UNIFIED SCHOOL DISTRICT

SAN DIMAS, CALIFORNIA

ABBREVIATIONS				GENERAL NOTES	APPLICABLE CODES	PROJECT DIRECTORY	INDEX OF DRAWINGS																																
@ < ~ A.B.F. A.F.F. A.G. ADJ. ALUM. APPROX. ARCH.	ANGLE AT CENTERLINE DIAMETER OR ROUND ANCHOR BOLT ABOVE FINISH FLOOR ASPHALTIC CONCRETE ADJACENT ALUMINUM APPROXIMATELY ARCHITECT	MAR MAT'L MAX MC M.B.B. MECH MET MFR MIN MISC MO MTD MUL	MARBLE MATERIAL MAXIMUM MEDICINE CABINET METAL CORNER BEAD MECHANICAL METAL MANUFACTURER MINIMUM MISCELLANEOUS MASONRY OPENING MOUNTED MULLION	1. VERIFY ALL DIMENSIONS, LOCATIONS OF EXISTING UTILITIES, AND CONDITIONS ON JOB SITE PRIOR TO START OF WORK OR PORTIONS OF WORK. NOTIFY ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND CONSTRUCTION DOCUMENTS. EXISTING CONDITIONS ARE INDICATED AS RESULT OF FIELD OBSERVATIONS, INFORMATION SHOWN ON AVAILABLE DOCUMENTS AND FIELD CONDITIONS AT TIME OF PREPARATION.	<u>PARTIAL LIST OF APPLICABLE CODES AS OF January 1, 2020*</u> 2019 California Administrative Code (CAC), Part 1, Title 24 CCR* 2019 California Building Code (CBC), Part 2, Title 24 CCR (2018 International Building Code, Vol. 1 & 2, and 2019 California amendments) 2019 California Electrical Code (CEC), Part 3, Title 24 CCR (2017 National Electrical Code and 2019 California Amendments) 2019 California Mechanical Code (CMC), Part 4, Title 24 CCR (2018 IAPMO Uniform Mechanical Code and 2019 California amendments) 2019 California Plumbing Code (CPC), Part 5, Title 24 CCR (2018 IAPMO Uniform Plumbing Code and 2019 California amendments) 2019 California Energy Code (CEC), Part 6, Title 24 CCR 2019 California Fire Code (CFC), Part 9, Title 24 CCR (2018 International Fire Code and 2019 California Amendments) 2019 California Existing Building Code (CEBC), Part 10, Title 24 CCR (2018 International Existing Building Code and 2019 California Amendments) 2019 California Referenced Standards Code, Part 12, Title 24 CCR Title 19 CCR, Public Safety, State Fire Marshal Regulations 2016 ASME A17.1/CSA B44-13 Safety Code for Elevators and Escalators (per 2019 CBC Part 2 CH 35) Note: Cal/OSHA Elevator Unit enforces CCR Title 8 and uses the 2004 ASME A17.1 b adoption <u>PARTIAL LIST OF APPLICABLE STANDARDS</u> NFPA 13 - Standard for the Installation of Sprinkler Systems (CA amended). 2016 Edition NFPA 14 - Standard for the Installation of Standpipe and Hose Systems (CA Amended) 2016 Edition NFPA 17 - Standard for Dry Chemical Extinguishing Systems 2017 Edition NFPA 17A - Standard for Wet Chemical Extinguishing Systems 2017 Edition NFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection 2016 Edition NFPA 22 - Standard for Water Tanks for Private Fire Protection 2013 Edition NFPA 24 - Standard for the Installation of Private Fire Service Mains and their Appurtenances (CA amended) 2016 Edition NFPA 72 - National Fire Alarm and Signaling Code (CA amended) 2016 Edition NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2016 Edition NFPA 2001 - Standard on Clean Agent Fire Extinguishing Systems (CA amended) 2015 Edition UL 300 - Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment 2005 (R2010) UL 464 - Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories 2003 Edition UL 521 - Standard for Heat Detectors for Fire Protective Signaling Systems 1999 Edition UL 1971 - Standard for Signaling Devices for the Hearing Impaired 2002 (R2010) ICC 300 - Standard for Bleachers, Folding and Telescopic Seating, and Grandstands 2017 Edition For a complete list of applicable NFPA standards refer to 2019 CBC (SFM) Chapter 35 and California Fire Code Chapter 80. See California Building Code Chapter 35 for State of California amendments to the NFPA Standards. *All parts of the 2019 California Building Code become effective January 1, 2020 except the effective date for the use of the 2019 Building Energy Efficiency Standards (Title 24, Part 1, Chapter 10) is January 8, 2019 and the effective date for the use of the California Administrative Code (Title 24, Part 1,Chapter 4) is January 8, 2019.	2019 California Administrative Code (CAC), Part 1, Title 24 CCR* 2019 California Building Code (CBC), Part 2, Title 24 CCR (2018 International Building Code, Vol. 1 & 2, and 2019 California amendments) 2019 California Electrical Code (CEC), Part 3, Title 24 CCR (2017 National Electrical Code and 2019 California Amendments) 2019 California Mechanical Code (CMC), Part 4, Title 24 CCR (2018 IAPMO Uniform Mechanical Code and 2019 California amendments) 2019 California Plumbing Code (CPC), Part 5, Title 24 CCR (2018 IAPMO Uniform Plumbing Code and 2019 California amendments) 2019 California Energy Code (CEC), Part 6, Title 24 CCR 2019 California Fire Code (CFC), Part 9, Title 24 CCR (2018 International Fire Code and 2019 California Amendments) 2019 California Existing Building Code (CEBC), Part 10, Title 24 CCR (2018 International Existing Building Code and 2019 California Amendments) 2019 California Referenced Standards Code, Part 12, Title 24 CCR Title 19 CCR, Public Safety, State Fire Marshal Regulations 2016 ASME A17.1/CSA B44-13 Safety Code for Elevators and Escalators (per 2019 CBC Part 2 CH 35) Note: Cal/OSHA Elevator Unit enforces CCR Title 8 and uses the 2004 ASME A17.1 b adoption <u>PARTIAL LIST OF APPLICABLE STANDARDS</u> NFPA 13 - Standard for the Installation of Sprinkler Systems (CA amended). 2016 Edition NFPA 14 - Standard for the Installation of Standpipe and Hose Systems (CA Amended) 2016 Edition NFPA 17 - Standard for Dry Chemical Extinguishing Systems 2017 Edition NFPA 17A - Standard for Wet Chemical Extinguishing Systems 2017 Edition NFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection 2016 Edition NFPA 22 - Standard for Water Tanks for Private Fire Protection 2013 Edition NFPA 24 - Standard for the Installation of Private Fire Service Mains and their Appurtenances (CA amended) 2016 Edition NFPA 72 - National Fire Alarm and Signaling Code (CA amended) 2016 Edition NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2016 Edition NFPA 2001 - Standard on Clean Agent Fire Extinguishing Systems (CA amended) 2015 Edition UL 300 - Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment 2005 (R2010) UL 464 - Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories 2003 Edition UL 521 - Standard for Heat Detectors for Fire Protective Signaling Systems 1999 Edition UL 1971 - Standard for Signaling Devices for the Hearing Impaired 2002 (R2010) ICC 300 - Standard for Bleachers, Folding and Telescopic Seating, and Grandstands 2017 Edition For a complete list of applicable NFPA standards refer to 2019 CBC (SFM) Chapter 35 and California Fire Code Chapter 80. See California Building Code Chapter 35 for State of California amendments to the NFPA Standards. *All parts of the 2019 California Building Code become effective January 1, 2020 except the effective date for the use of the 2019 Building Energy Efficiency Standards (Title 24, Part 1, Chapter 10) is January 8, 2019 and the effective date for the use of the California Administrative Code (Title 24, Part 1,Chapter 4) is January 8, 2019.	BONITA UNIFIED SCHOOL DISTRICT 115 WEST ALLEN AVE. SAN DIMAS, CA. 91773-1437 SCHOOL SAN DIMAS HIGH SCHOOL 800 WEST COVINA BLVD. SAN DIMAS, CA. 91773-1437 ARCHITECT ARCHITECTURE 9, PLLLP 8816 FOOTHILL BOULEVARD, SUITE 103-224 RANCHO CUCAMONGA, CA. 91730 contact@architecture9.com STRUCTURAL T&B ENGINEERING, INC. 4344 LATHAM STREET RIVERSIDE, CA. 92501 ELECTRICAL/PLUMBING/LOW VOLTAGE PBS ENGINEERS 2100 EAST ROUTE 66, SUITE 101 GLENORA, CA 91740	GENERAL G1.0 TITLE SHEET ARCHITECTURAL A1.1 OVERALL SITE PLAN A1.2 ENLARGED PARKING LOT & SITE DETAILS A1.3 SITE DETAILS & ROOF PLAN A2.1 ENLARGED TOILET FLOOR PLAN & ELEVATIONS A3.1 SIGNAGE STRUCTURAL S0.1 STRUCTURAL NOTES S0.2 STRUCTURAL DETAILS S2.1 GYMNASIUM ROOF FRAMING PLAN MECHANICAL M0.1 GENERAL NOTES, APPLICABLE CODES AND SHEET INDEX M0.2 MECHANICAL SCHEDULES M0.3 T24 COMPLIANT FORMS M0.4 T24 COMPLIANT FORMS M0.5 T24 COMPLIANT FORMS M2.1 MECHANICAL DEMO FLOOR PLANS - GYMNASIUM M2.2 MECHANICAL DEMO ROOF PLANS - GYMNASIUM M2.3 MECHANICAL REMODEL FLOOR PLANS - GYMNASIUM M2.4 MECHANICAL REMODEL ROOF PLANS - GYMNASIUM M3.1 MECHANICAL DETAILS M3.2 MECHANICAL DETAILS M3.3 MECHANICAL DETAILS M4.1 MECHANICAL CONTROLS ELECTRICAL E0.1 GENERAL NOTES, APPLICABLE CODES AND SHEET INDEX E0.2 SYMBOLS LIST & ABBREVIATIONS E0.3 SINGLE LINE DIAGRAM AND PANEL SCHEDULE E2.1 ELECTRICAL FLOOR PLAN E2.2 ELECTRICAL DEMO ROOF PLAN E2.3 ELECTRICAL REMODEL ROOF PLAN E3.1 ELECTRICAL DETAILS FIRE ALARM EF0.1 GENERAL NOTES, APPLICABLE CODES AND SHEET INDEX EF2.1 FIRE ALARM REMODEL PLAN EF3.1 FIRE ALARM DETAILS																															
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ARCHITECTS STAMP:

CONSULTANT:

CONSULTANTS STAMP:

SCHOOL DISTRICT:
**BONITA UNIFIED
SCHOOL DISTRICT**

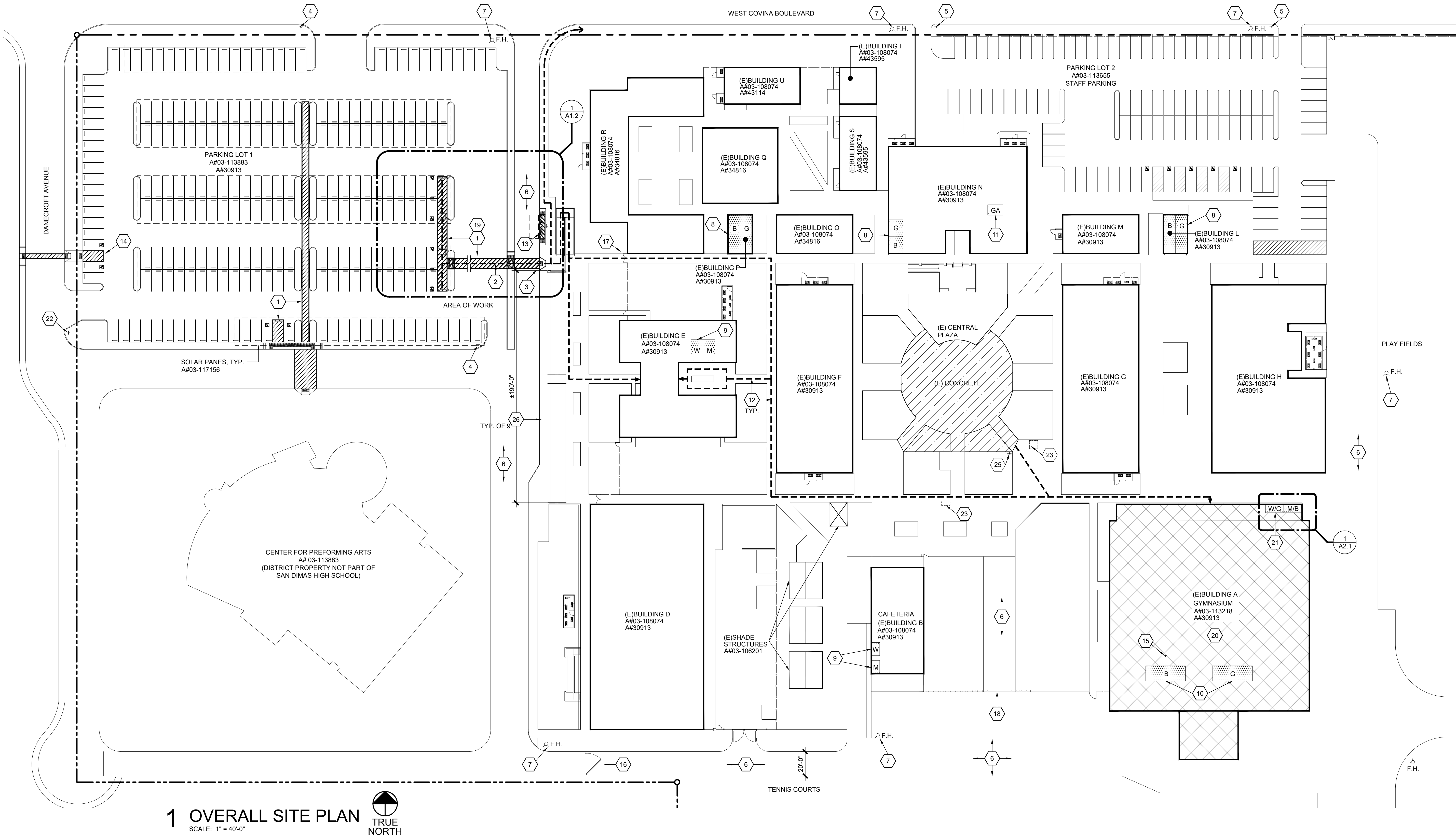
PROJECT:
**SAN DIMAS H.S.
GYMNASIUM HVAC
REPLACEMENT**

JOB NUMBER: 12.03.03
DATE: 09/17/2021

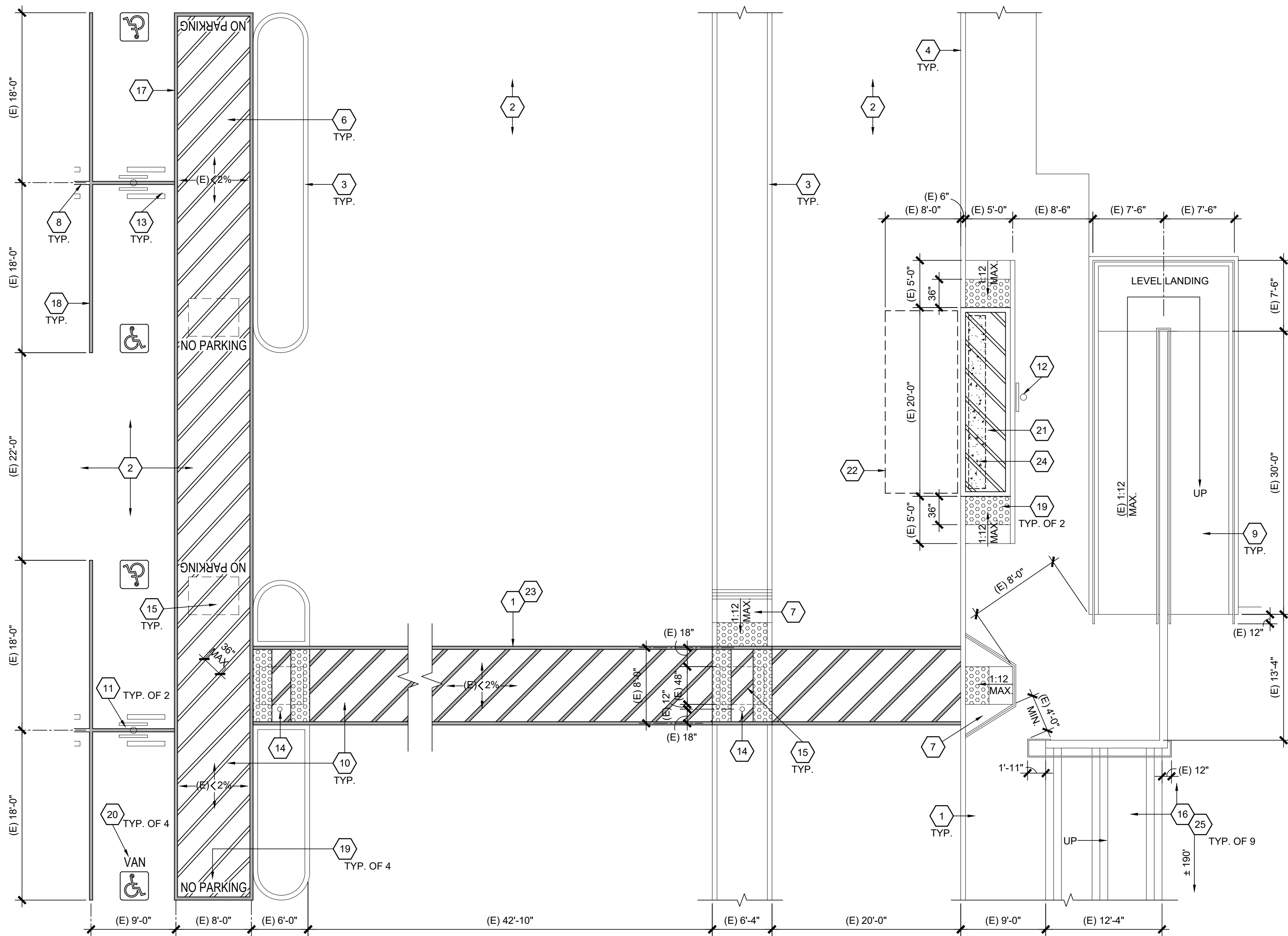
REVISION: DATE: _____
REVISION: DATE: _____

DRAWING TITLE:
TITLE SHEET

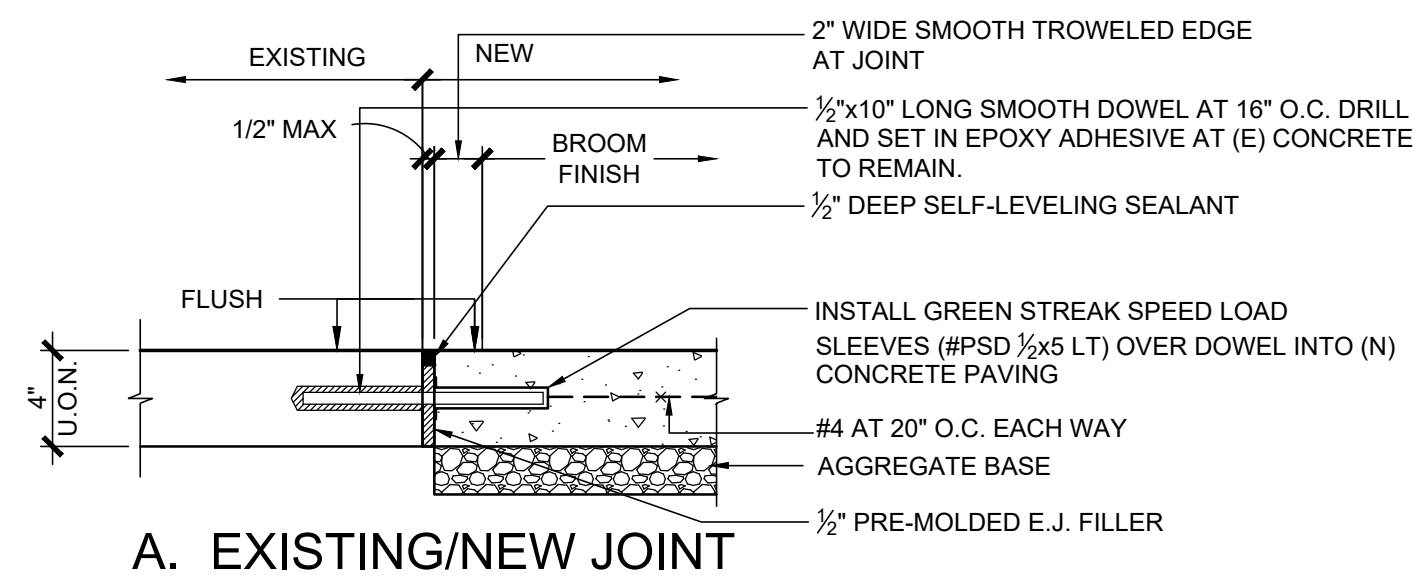
DRAWING NO.:
G1.0



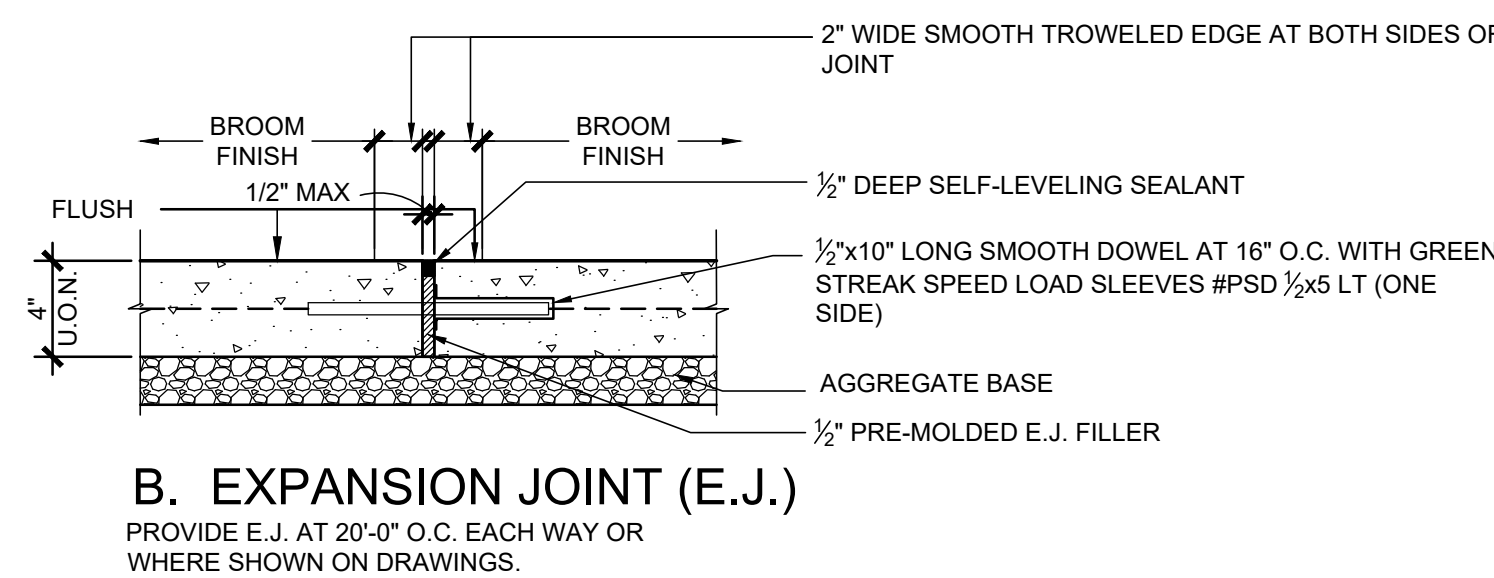
<div>GENERAL NOTES</div> <div><div><div>A.</div><div>FOR TYP. SYMBOLS AND ABBREVIATIONS, SEE SHEET G1.0.</div></div><div><div>B.</div><div>PROVIDE TEMPORARY 6' HIGH CHAIN LINK FENCE ENCLOSURES WITH SCREENING FABRIC AND LOCKABLE GATES AS REQUIRED FOR CONSTRUCTION ACCESS AT CONTRACTOR'S STAGING AREA AND AROUND ALL CONSTRUCTION SITES.</div></div><div><div>C.</div><div>WHERE (E) LAWNS ARE DAMAGED BY THE EXECUTION OF THIS CONTRACT, FILL, COMPACT, AND REPLANT.</div></div><div><div>D.</div><div>CONTRACTOR SHALL MAINTAIN EXISTING PLANTING WITHIN THE JOB SITE FENCE ENCLOSURE DURING DEMOLITION AND CONSTRUCTION PHASES. EXISTING IRRIGATION SYSTEMS SHALL EITHER REMAIN OPERATIONAL FOR CONTRACTOR'S USE OR CONTRACTOR SHALL HAND WATER EXISTING PLANT MATERIALS AS REQUIRED.</div></div><div><div>E.</div><div>REPAIR EXISTING IRRIGATION SYSTEMS DAMAGED DURING THE EXECUTION OF THIS CONTRACT. REPLACE PLANT MATERIALS DAMAGED DURING THE CONSTRUCTION PERIOD WITH THE SAME SPECIES OF EQUAL OR GREATER SIZE.</div></div><div><div>F.</div><div>A MINIMUM OF 15% OF ALL SCOPE WORK MUST BE PERFORMED IN-HOUSE BY GENERAL CONTRACTOR</div></div><div><div>G.</div><div>ALL WORK SHALL CONFORM TO 2019 TITLE 24, CALIFORNIA CODE OF REGULATIONS (CCR).</div></div><div><div>H.</div><div>A DSA ACCEPTED TESTING LABORATORY DIRECTLY EMPLOYED BY THE DISTRICT (OWNER) SHALL CONDUCT ALL THE REQUIRED TESTS AND INSPECTIONS FOR THE PROJECT.</div></div><div><div>I.</div><div>GRADING PLANS, DRAINAGE IMPROVEMENTS, ROAD AND ACCESS REQUIREMENTS AND ENVIRONMENTAL HEALTH CONSIDERATIONS SHALL COMPLY WITH ALL LOCAL ORDINANCE.</div></div></div>



1 EXISTING PATH OF TRAVEL
SCALE: 1/8" = 1'-0"

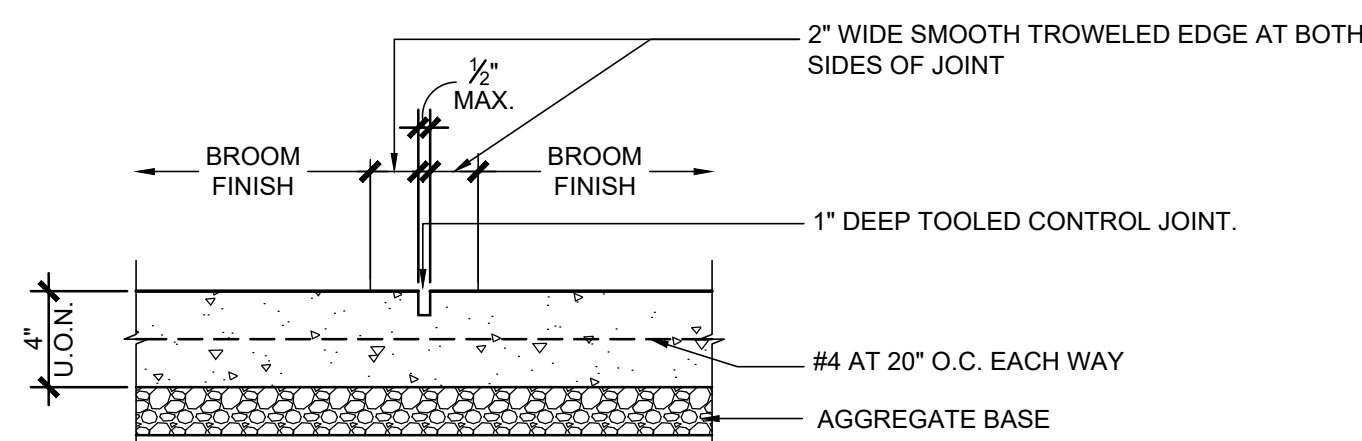


A. EXISTING/NEW JOINT



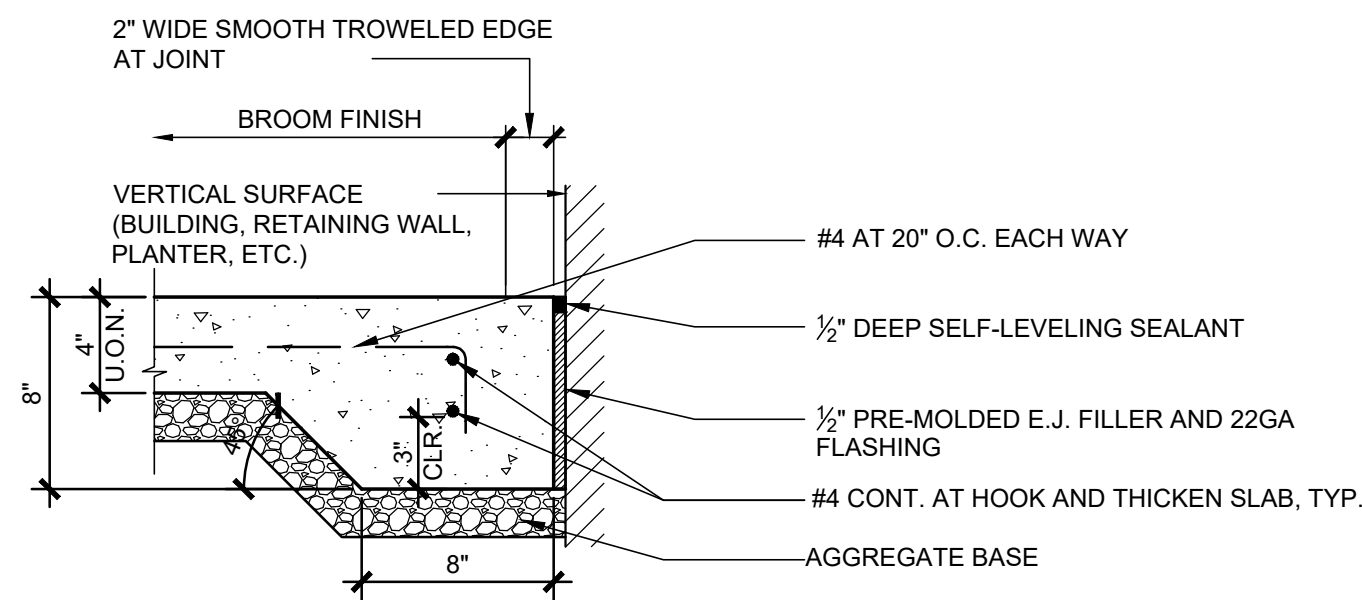
B. EXPANSION JOINT (E.J.)

PROVIDE E.J. AT 20'-0" O.C. EACH WAY OR WHERE SHOWN ON DRAWINGS.



C. CONTROL JOINT (C.J.)

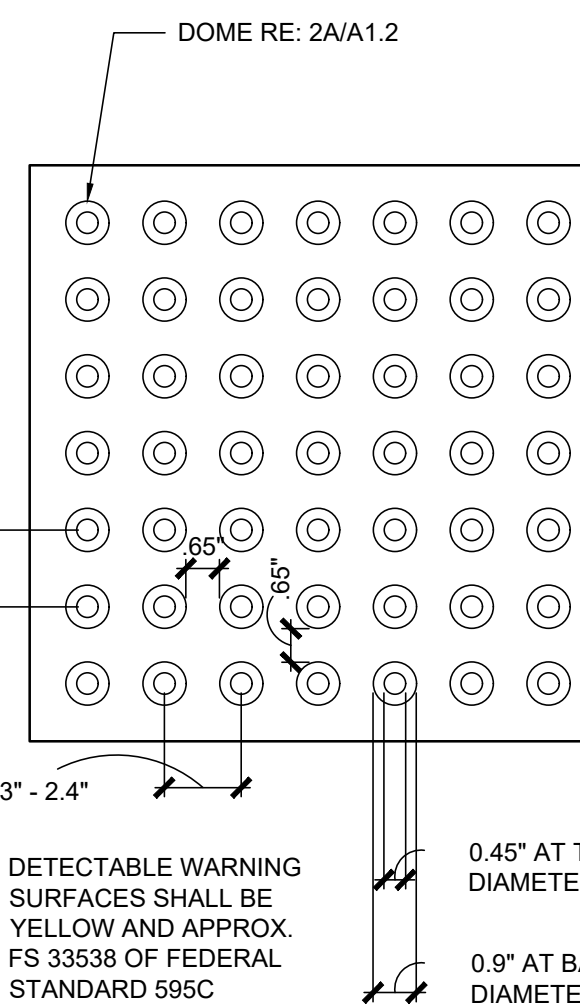
PROVIDE C.J. SPACING EQUAL TO SIDEWALK WIDTH OR 10'-0" MAXIMUM O.C. EACH WAY RE: SITE PLAN DRAWINGS FOR ADDITIONAL REQUIREMENTS.



D. EXPANSION JOINT AT VERTICAL SURFACE

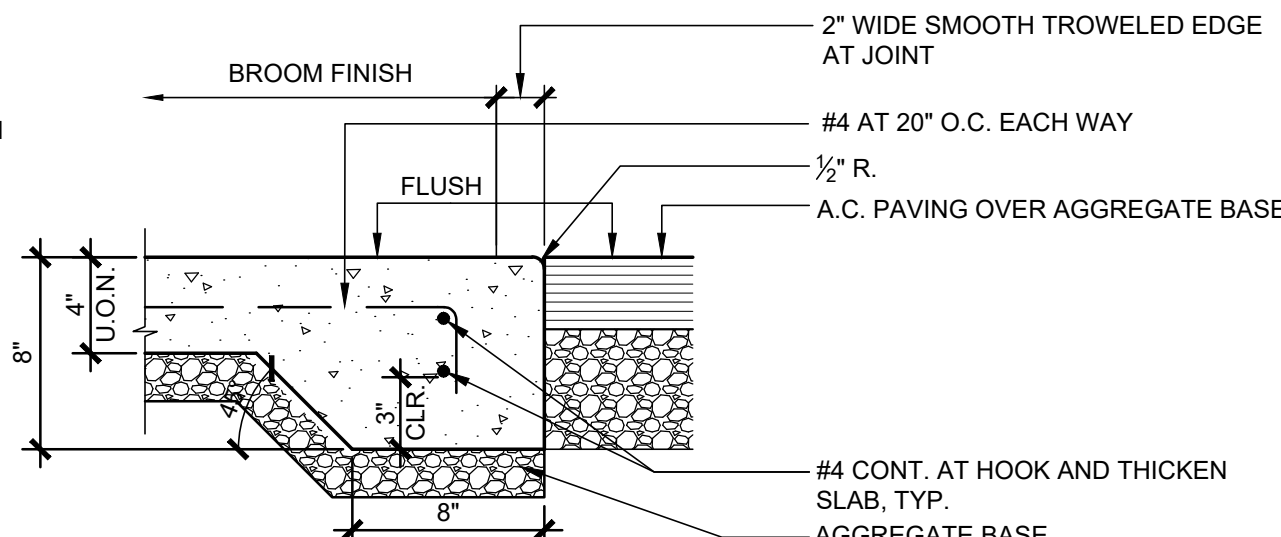
2A SECTION AT DOME

SCALE: N.T.S.

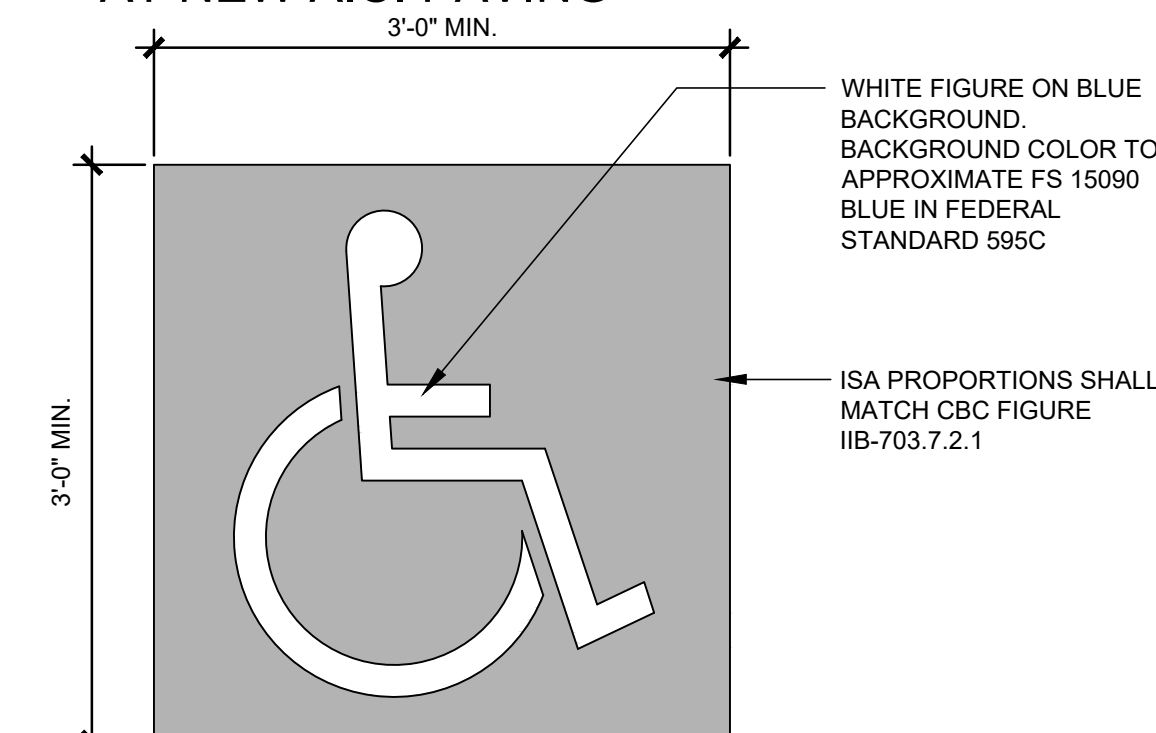


2 TUNCATED DOME SURFACE

SCALE: N.T.S.



E. TERMINATION OF NEW CONCRETE AT NEW A.C. PAVING



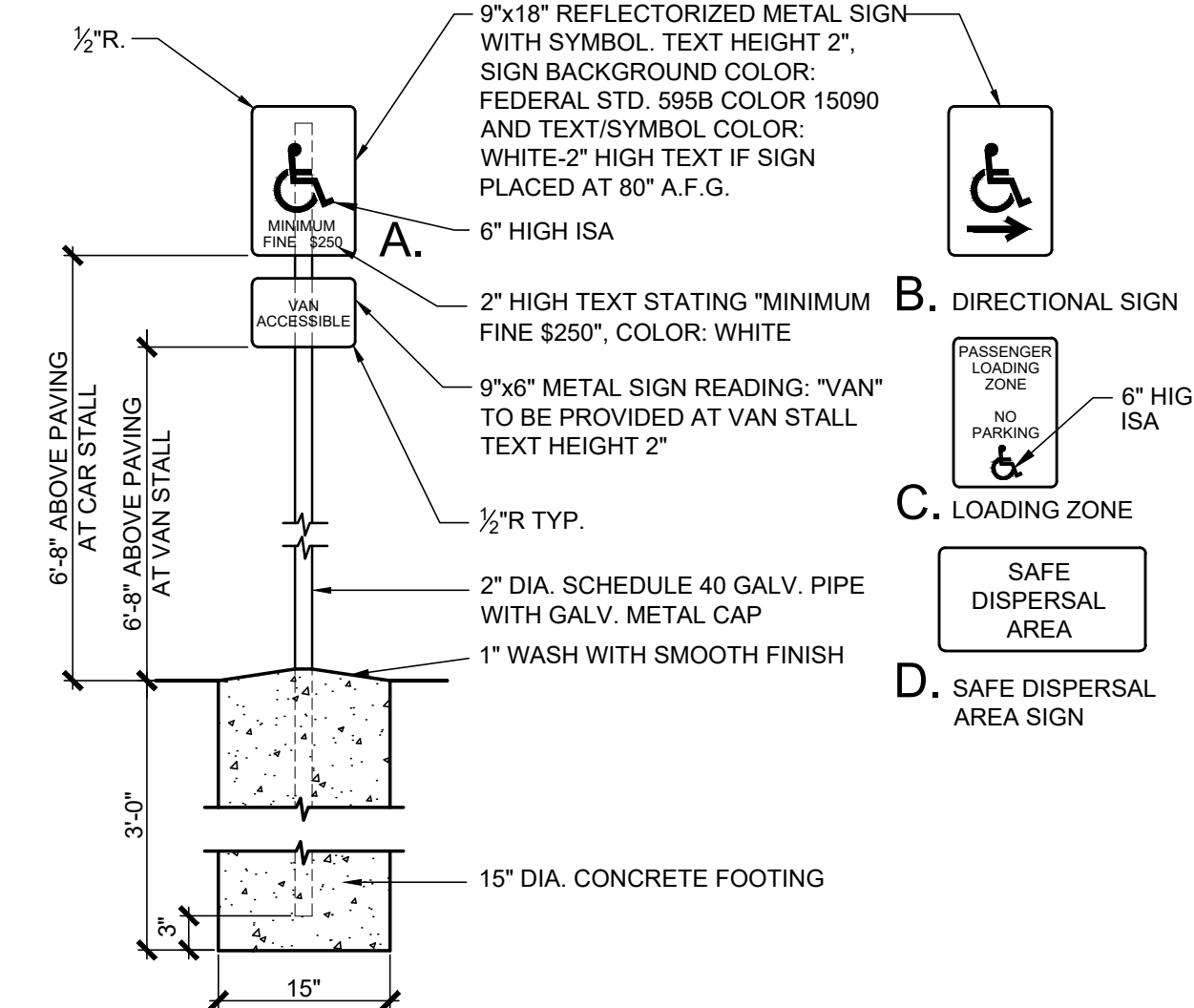
NOTE: MARKINGS THAT EXCEED THE MINIMUM DIMENSIONS SHALL SCALE THE FIGURE PROPORTIONALLY WITH THE BACKGROUND.

5 ACCESSIBLE PARKING SYMBOL

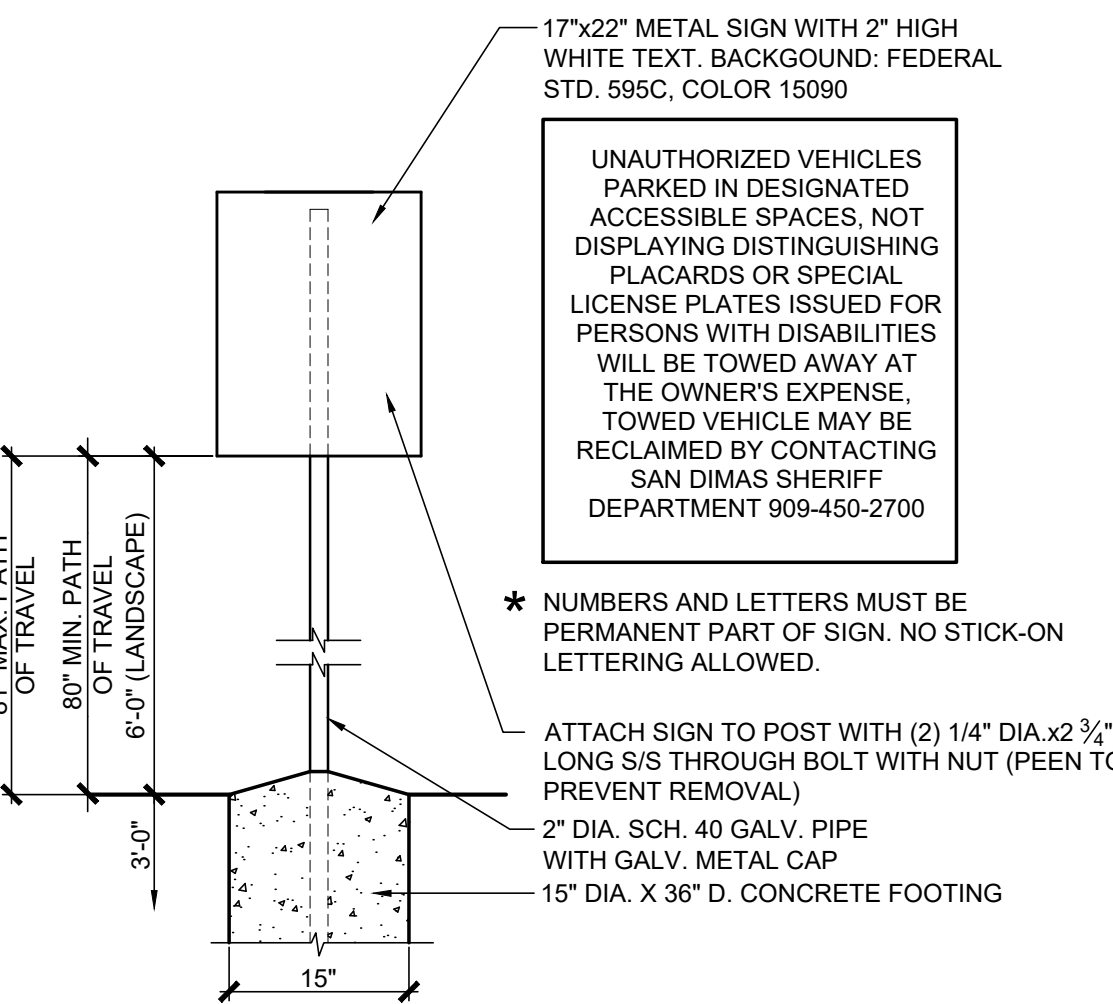
SCALE: 1" = 1'-0"

KEYNOTES

- EXISTING CONCRETE SIDEWALK (< 2% ALL DIRECTIONS) TO REMAIN, PROTECT
- EXISTING ASPHALTIC CONCRETE PAVING TO REMAIN, PROTECT
- EXISTING CONCRETE RAISED ISLAND TO REMAIN, PROTECT
- EXISTING CONCRETE CURB TO REMAIN, PROTECT
- EXISTING TURF TO REMAIN, PROTECT
- EXISTING ACCESSIBLE (< 2% ALL DIRECTIONS) ASPHALTIC CONCRETE PAVING TO REMAIN
- EXISTING ACCESSIBLE CURB RAMP TO REMAIN, (A# 03-113883), PROTECT
- EXISTING WHITE PARKING STALL STRIPE TO REMAIN, PROTECT
- EXISTING ACCESSIBLE CONCRETE RAMP AND RAILINGS TO REMAIN, (A#03-108074), PROTECT
- RE-PAINT ALL EXISTING PAINTED (YELLOW, WHITE, AND BLUE) STRIPPING, SYMBOLS, AND LETTERING AS SPECIFIED
- EXISTING DOUBLE-SIDED ACCESSIBLE PARKING STALL SIGN TO REMAIN (A#03-113883), PROTECT, RE: 3A/A1.2
- EXISTING ACCESSIBLE LOADING ZONE AND DIRECTIONAL SIGN TO REMAIN, (A#03-113883), CLEAN AND PROTECT, RE: 3B & 3C/A1.2
- EXISTING CONCRETE WHEEL STOP TO REMAIN, PROTECT
- EXISTING PIPE BOLLARD TO REMAIN, RE-PAINT YELLOW
- EXISTING TRUNCATED DOMES TO REMAIN (A#03-113883), PROTECT
- EXISTING CONCRETE STAIRS AND RAILINGS TO REMAIN (A#03-108074)
- RE-PAINT EXISTING ACCESSIBLE (EXISTING < 2% ALL DIRECTIONS) CROSSWALK AND/OR PATH OF TRAVEL WITH 4" W. PAINTED BLUE (FEDERAL STD. 595C, COLOR: 15090) BORDER AND 4" W. PAINTED WHITE DIA. STRIPPING AT 36" O.C.
- RE-PAINT EXISTING 4" W. PAINTED BORDER BLUE (FEDERAL STD. 595C, COLOR: 15090)
- NEW SURFACE-MOUNTED TRUNCATED DOMES, RE: 7/A1.2
- RE-PAINT EXISTING 36" SQ. PAINTED ACCESSIBLE PARKING STALL SYMBOL, RE: 2/A1.2
- RE-PAINT EXISTING ACCESSIBLE (EXISTING < 2% ALL DIRECTIONS) W/4" W. PAINTED WHITE STRIPPING (BORDER AND DIAGONAL)
- NEW 4" W. X 36" L. PAINTED WHITE DASHED LINE
- RE-PAINT EXISTING CONCRETE PAVING CROSS WALK (EXISTING < 2% ALL DIRECTIONS) WITH 4" W. PAINTED BLUE (FEDERAL STD 595C, COLOR: 15090) BORDER AND DIAGONAL STRIPPING
- REMOVE EXISTING RECESSED TRUNCATED DOMES AND INFILL WITH NEW CONCRETE PAVING, RE: 4/A1.2
- PAINT / REPAINT 2" MIN WIDE CONTRASTING COLOR STRIPE AT EACH STAIR TREAD NOSING, LOCATE 1" FROM NOSE OF STEPS, RE: A1.1

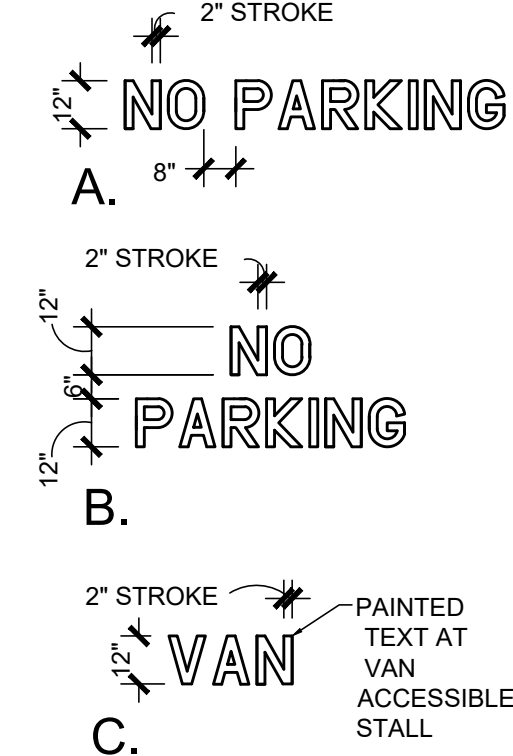


3 ACCESSIBLE PARKING STALL SIGN
SCALE: 3/4" = 1'-0"



6 TOW-AWAY SIGN

SCALE: 3/4" = 1'-0"



PAVEMENT MARKING NOTES:

- IF A MESSAGE CONSISTS OF MORE THAN ONE WORD, IT SHOULD READ "UP"; THE FIRST WORD SHOULD BE NEAREST THE DRIVER
- THE SPACE BETWEEN WORDS SHOULD BE AT LEAST FOUR TIMES THE HEIGHT OF THE CHARACTER FOR LOW SPEED ROADS, BUT NOT MORE THAN TEN TIMES THE HEIGHT OF THE CHARACTERS. THE SPACE MAY BE REDUCED APPROPRIATELY WHERE THERE IS LIMITED SPACE BECAUSE OF LOCAL CONDITIONS
- MINIMUMS AND MAXIMUMS ARE TO BE STRICTLY ENFORCED
- ALL LETTERS SHOULD BE IN CONFORMANCE WITH THE "STANDARD" ALPHABETS FOR HIGHWAY SIGNS AND PAVEMENT MARKINGS PRINTED BY THE U.S. DEPARTMENT OF TRANSPORTATION
- PORTIONS OF A LETTER, NUMBER OR SYMBOL MAY BE SEPARATED BY CONNECTING SEGMENTS NOT TO EXCEED 2" WIDTH
- PAINT COLOR (WHITE OR YELLOW) SHOULD CONTRAST TO ANY PAINTED STRIPE BELOW

4 CONCRETE SIDEWALK AND PAVING JOINT DETAILS

SCALE: 1'-1/2" = 1'-0"

7 TRAFFIC CONTROL PAVEMENT MARKING

SCALE: 1'-1/2" = 1'-0"

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ARCHITECTS STAMP:



CONSULTANT:

CONSULTANTS STAMP:

SCHOOL DISTRICT:
**BONITA UNIFIED
SCHOOL DISTRICT**

PROJECT:
**SAN DIMAS H.S.
GYMNASIUM HVAC
REPLACEMENT**

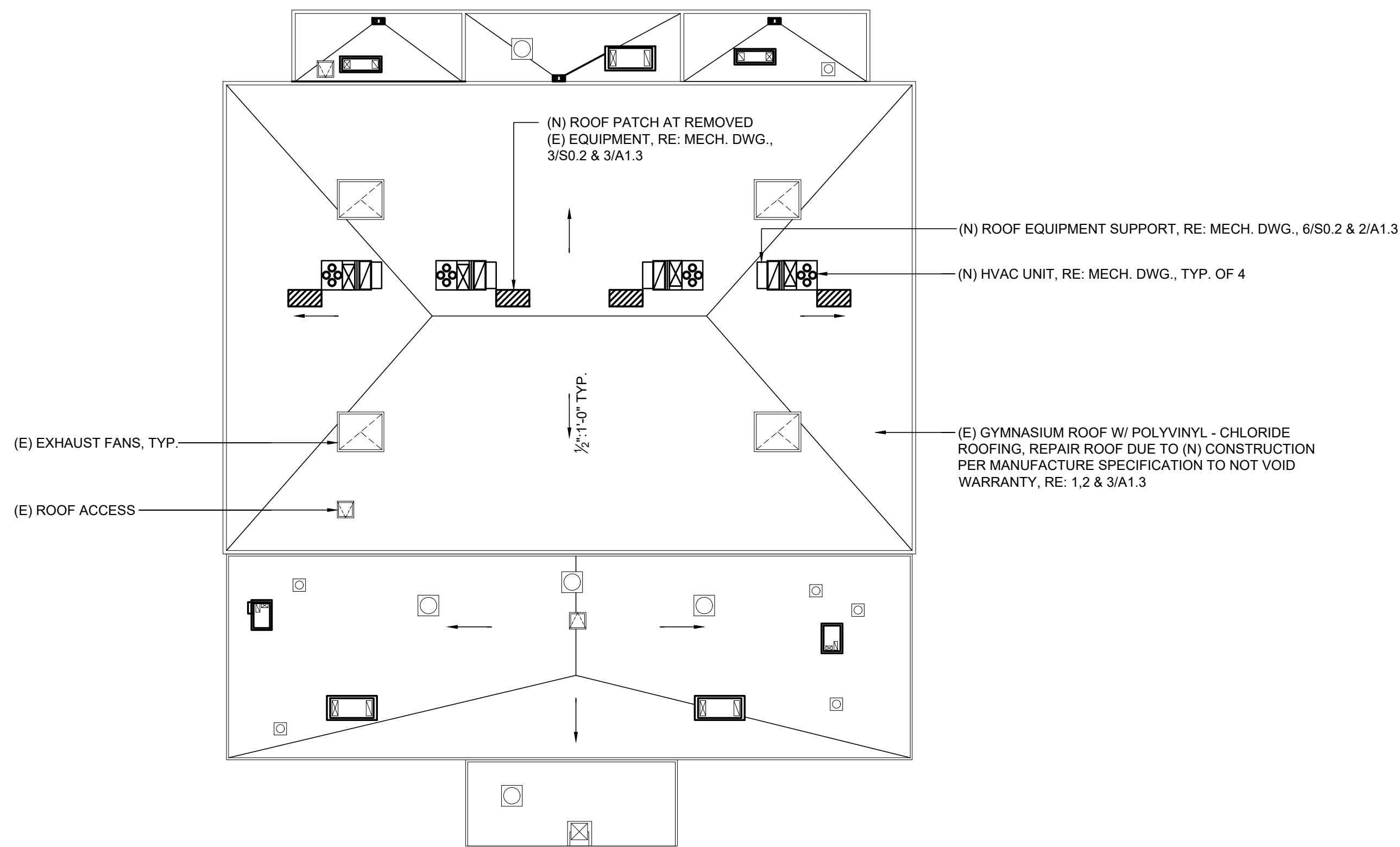
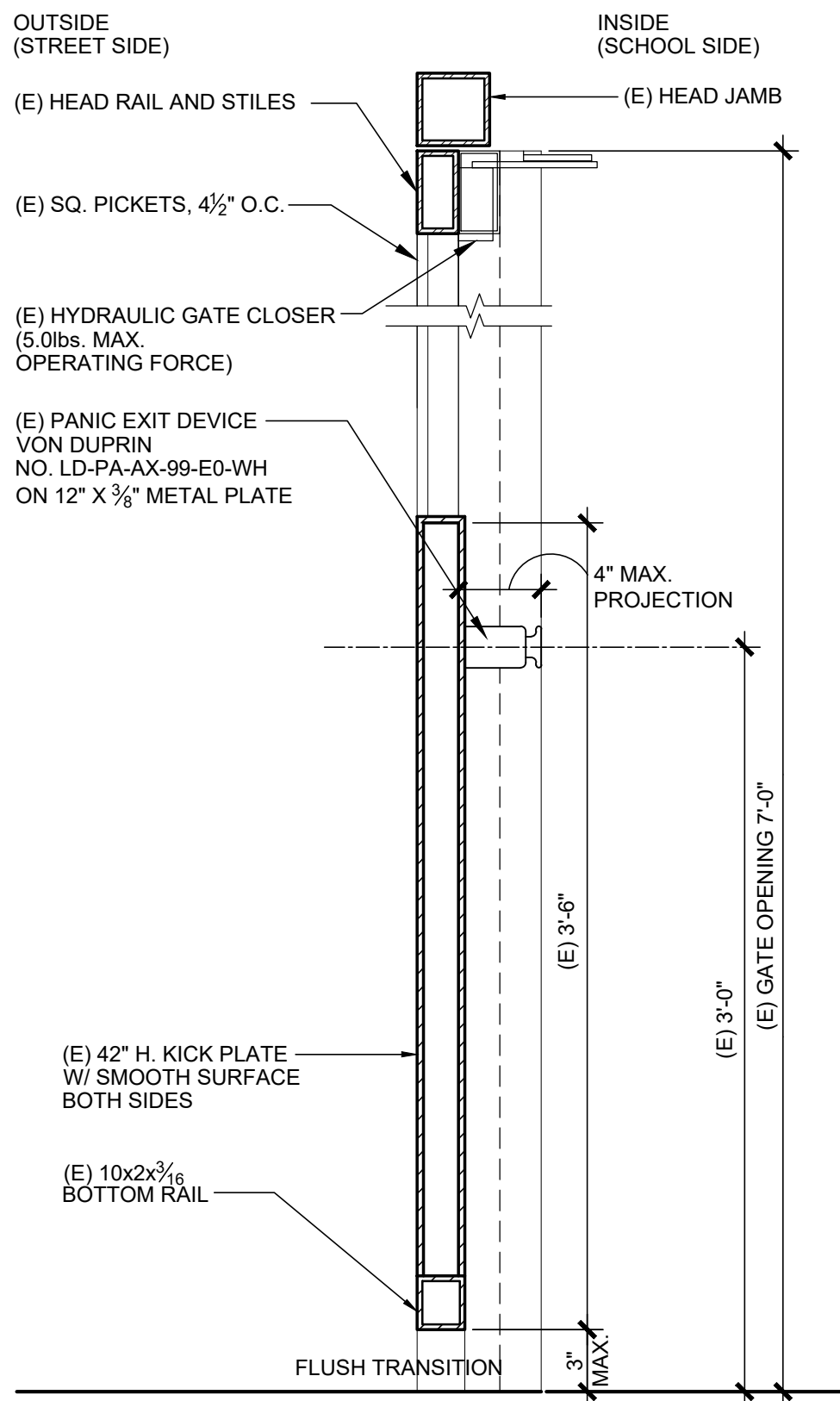
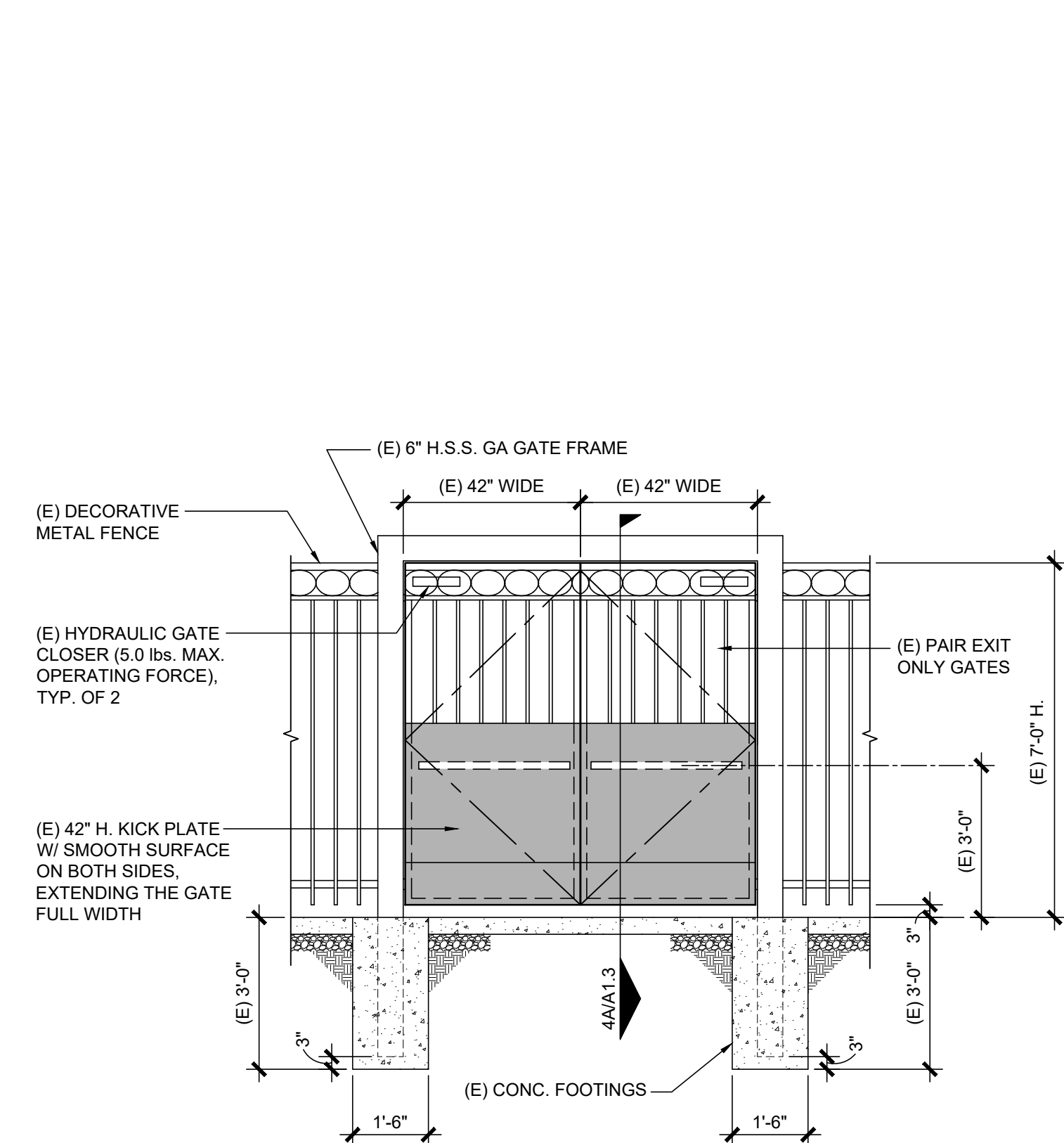
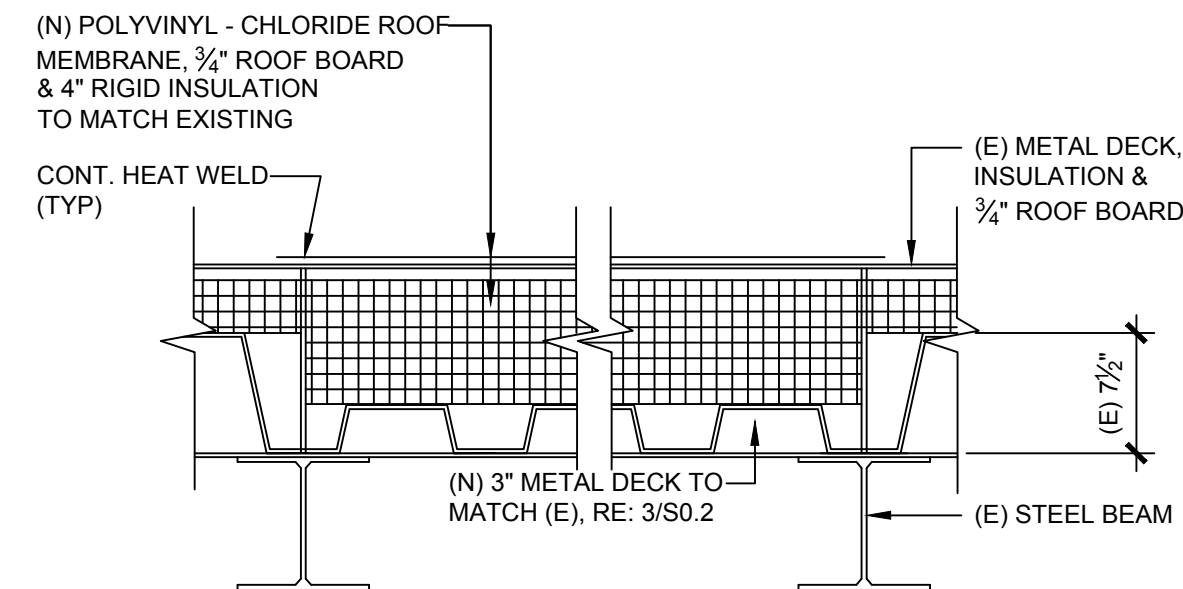
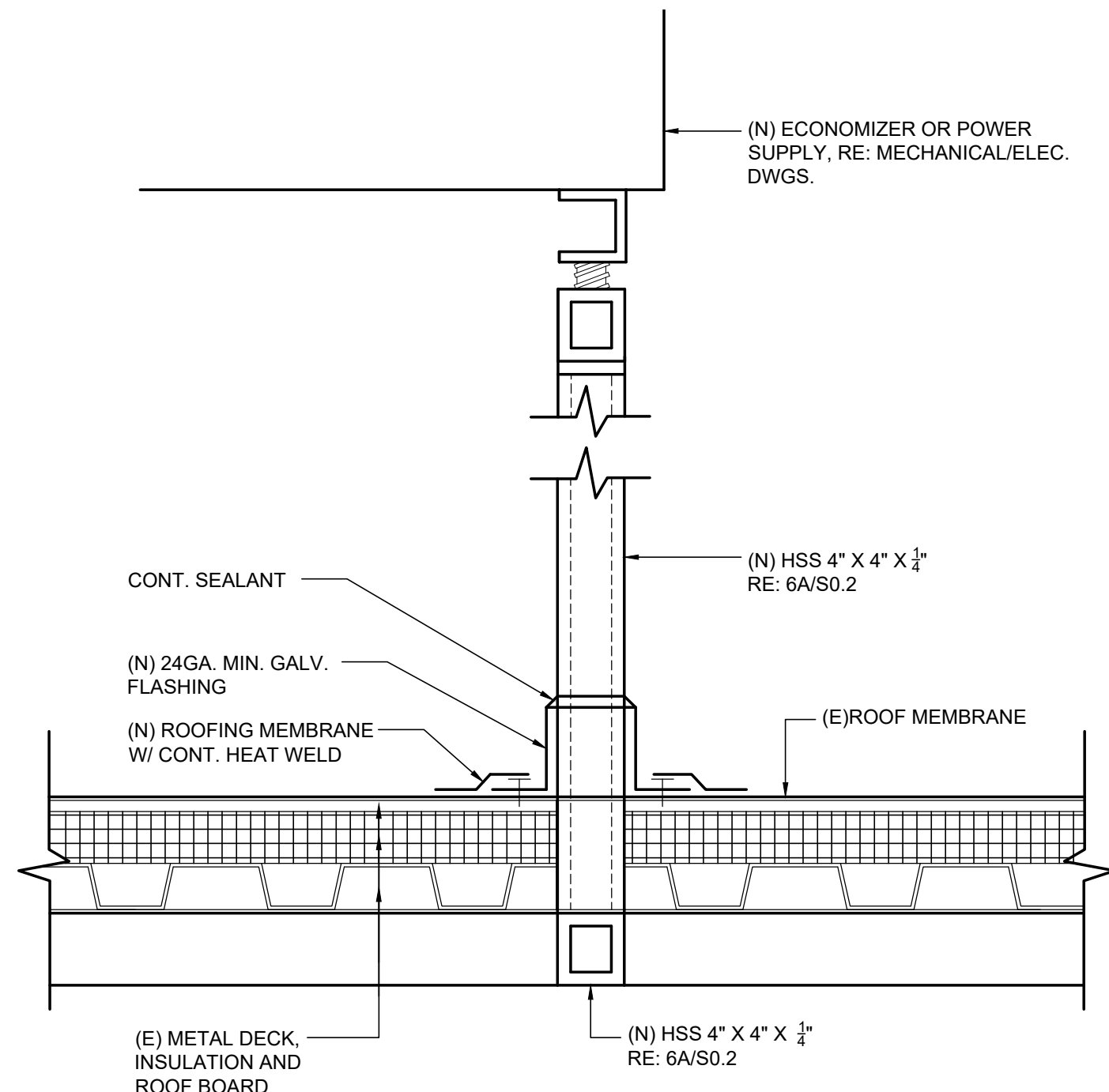
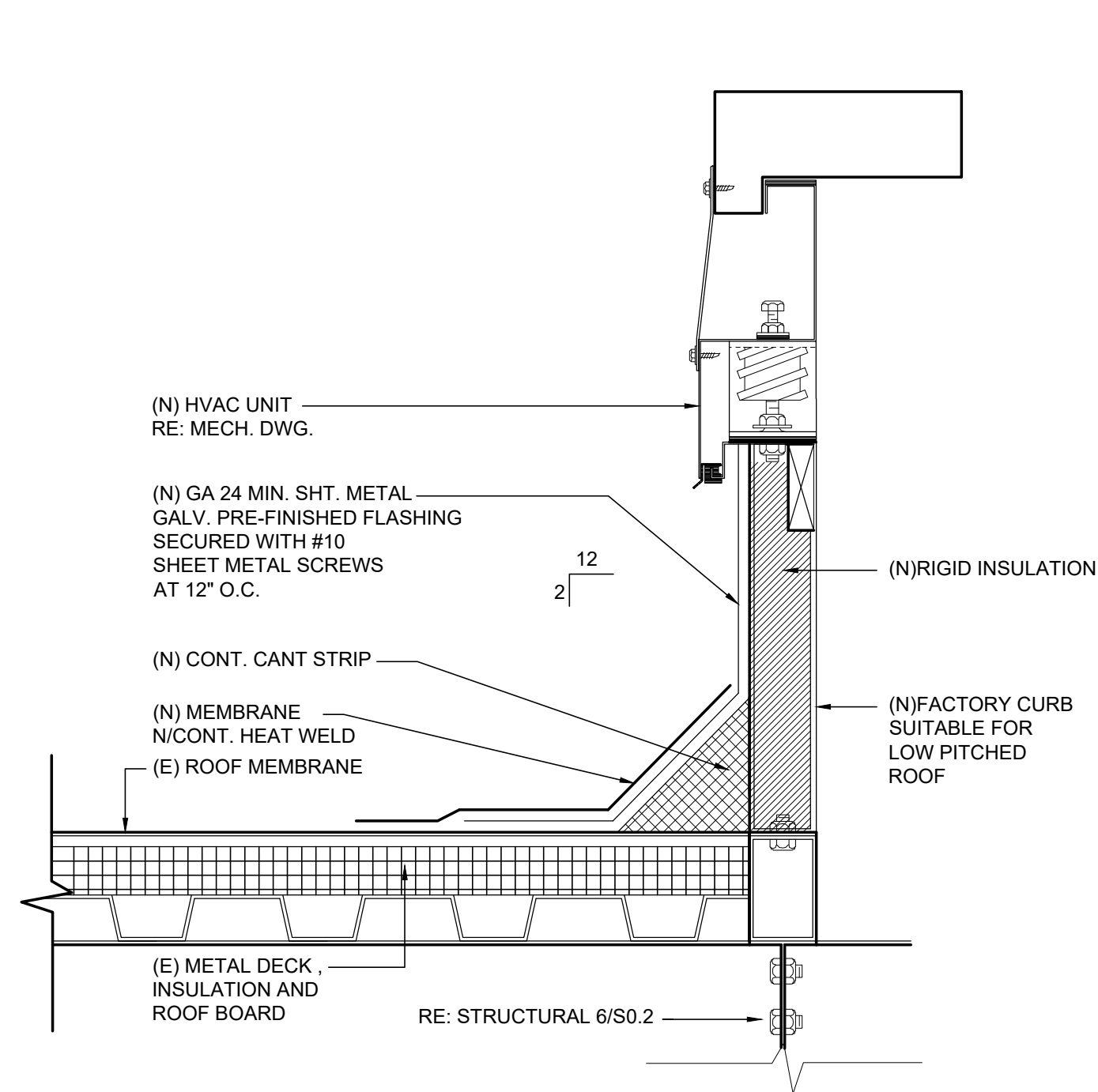
JOB NUMBER: 12.03.03
DATE: 09/17/2021

REVISION: DATE:
REVISION: DATE:

DRAWING TITLE:
**ENLARGED
PARKING LOT &
SITE DETAILS**

DRAWING NO.:

A1.2



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ARCHITECTS STAMP:



CONSULTANT:

CONSULTANTS STAMP:

SCHOOL DISTRICT:

BONITA UNIFIED
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PROJECT:

SAN DIMAS H.S.
GYMNASIUM HVAC
REPLACEMENT

JOB NUMBER: 12.03.03
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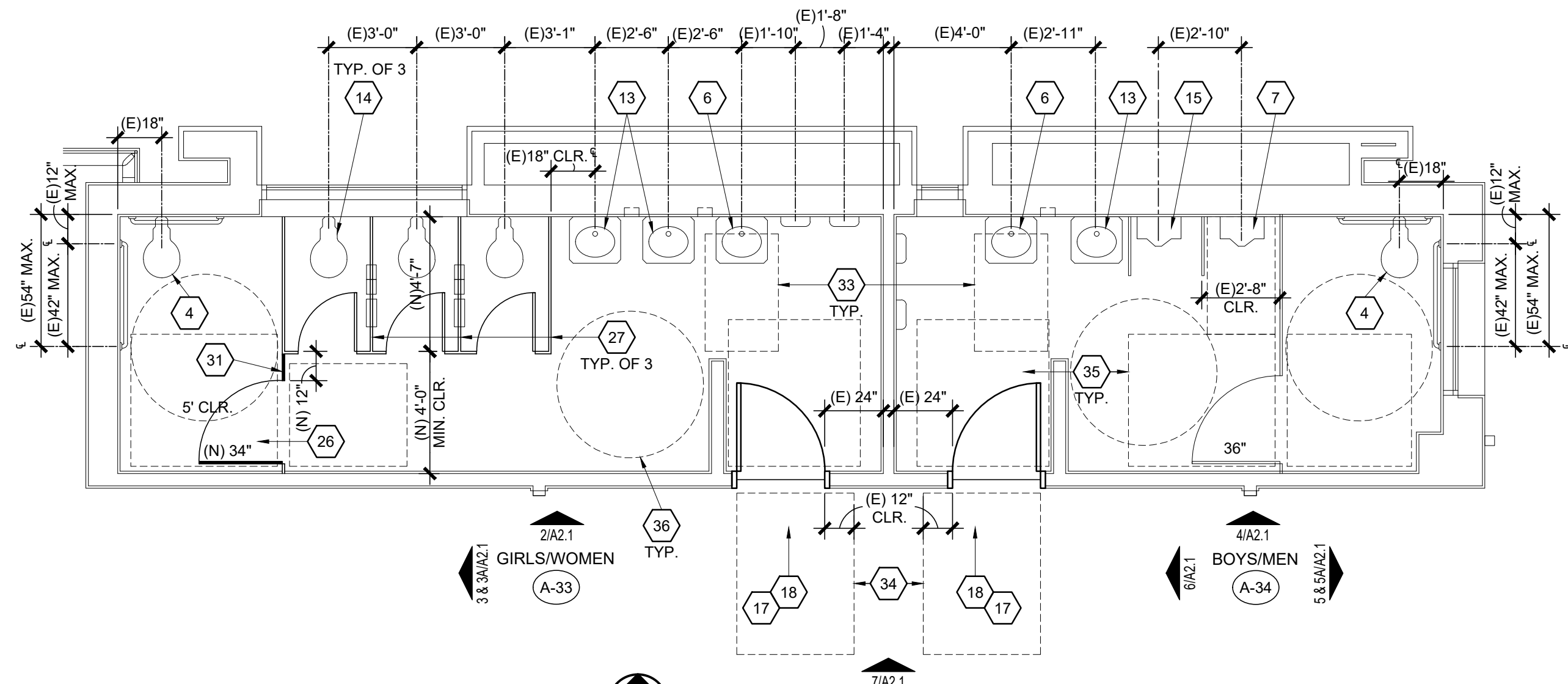
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REVISION: 2 DATE: _____

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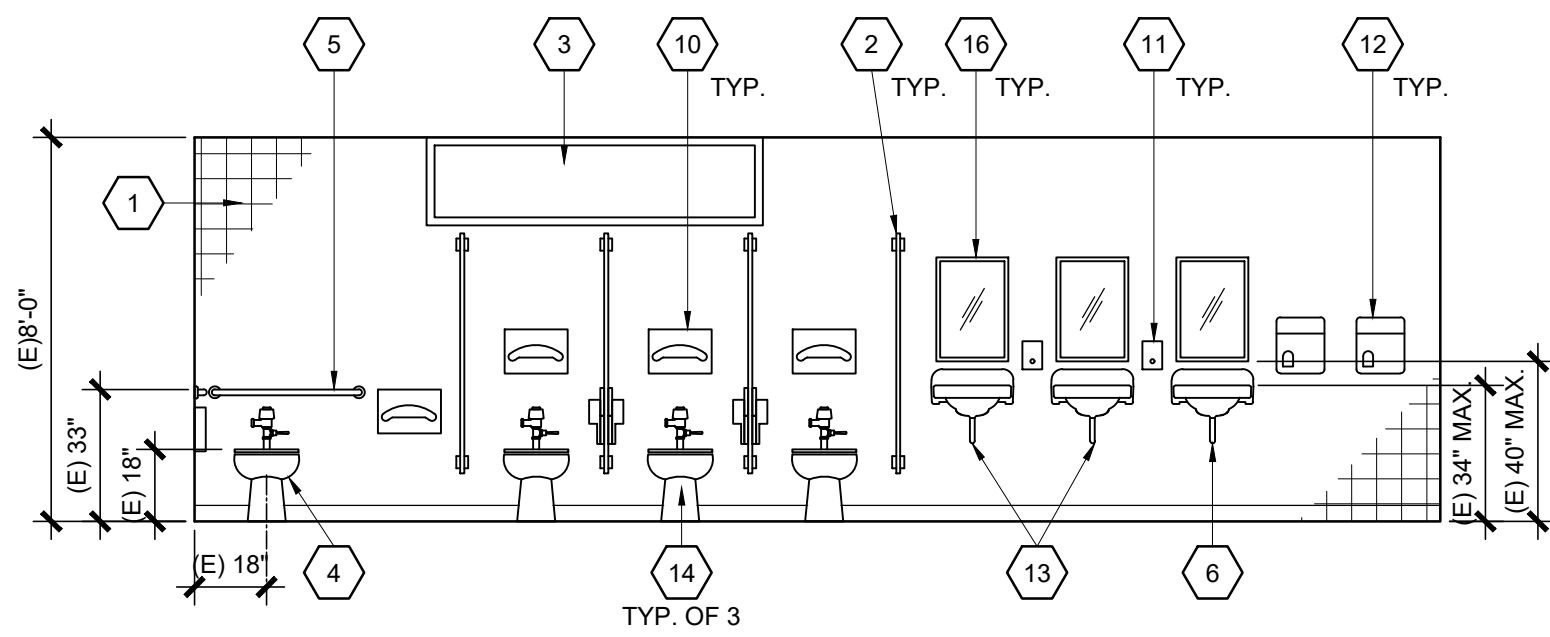
SITE DETAILS
& ROOF PLAN

DRAWING NO.:

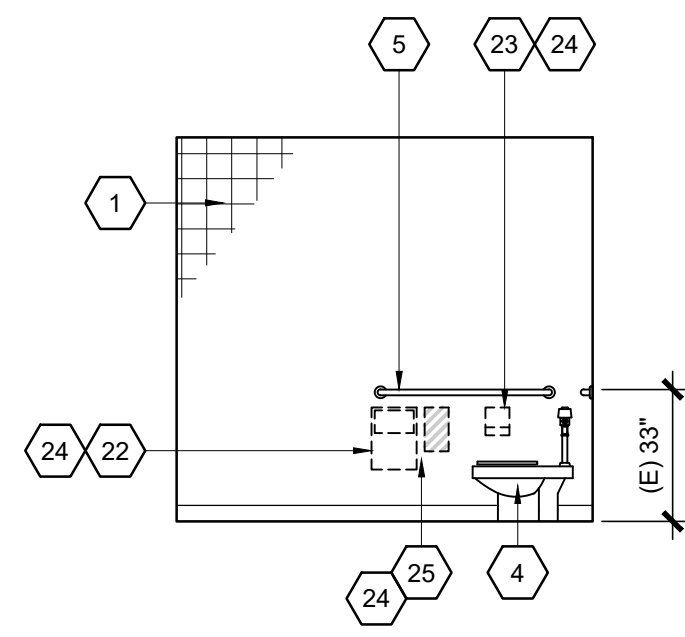
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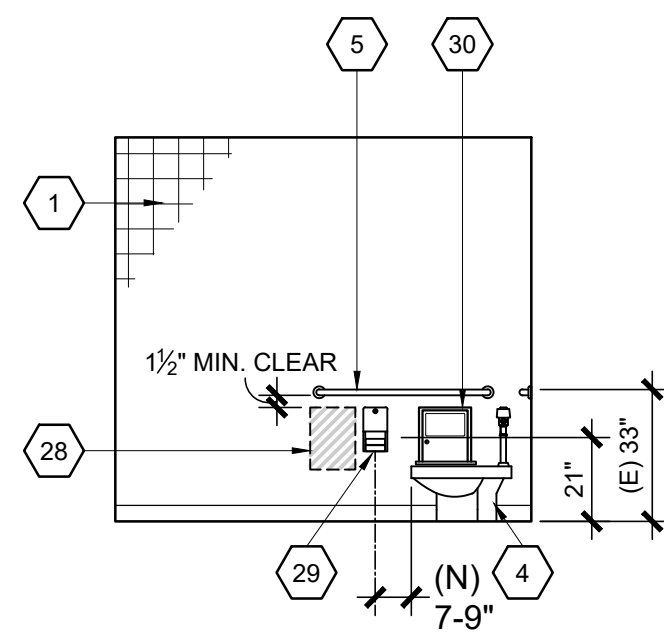
1 ENLARGED FLOOR PLAN
SCALE: 1/4" = 1'-0"
A#03-113218 NORTH



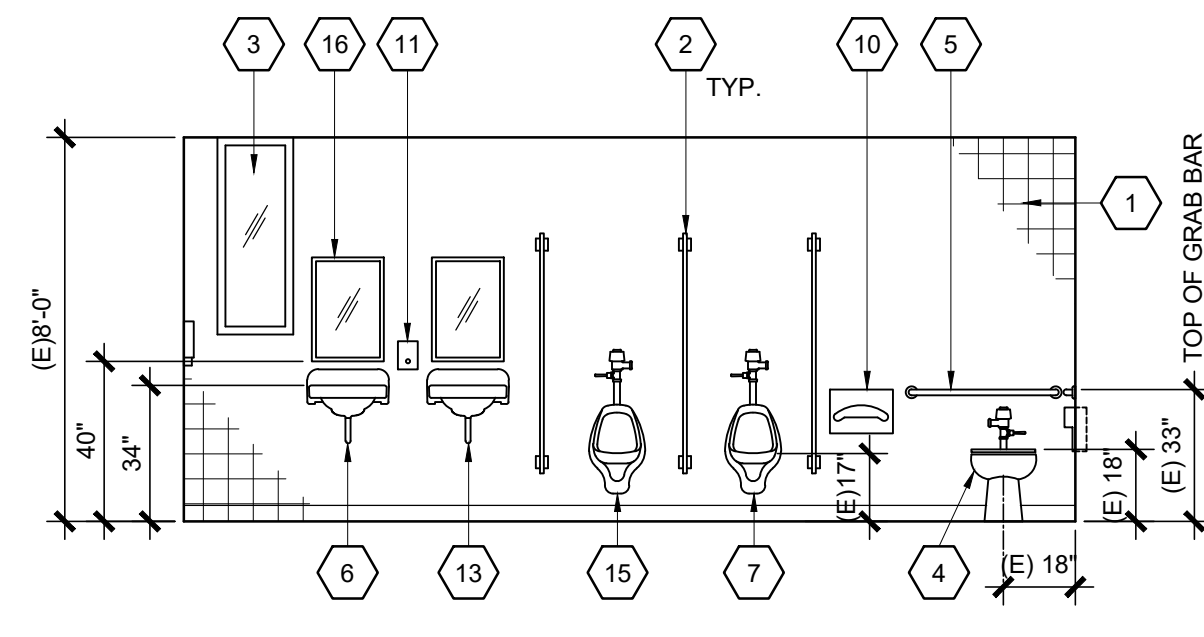
2 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113218



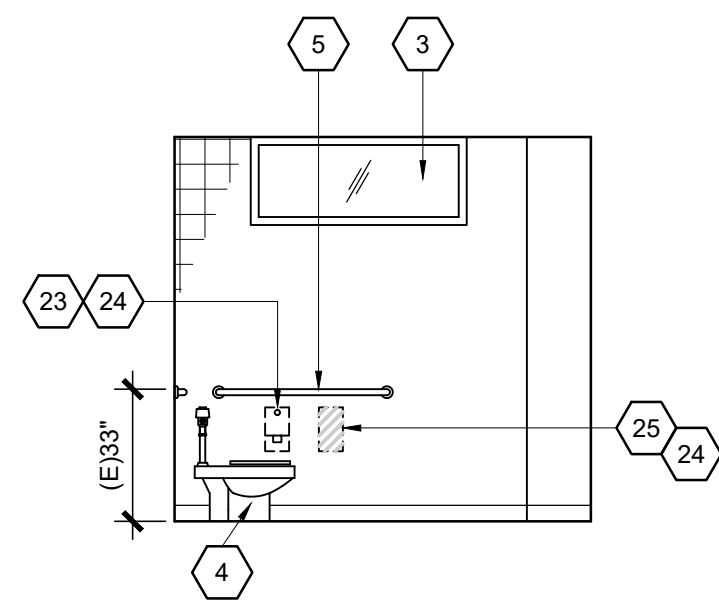
3 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113218



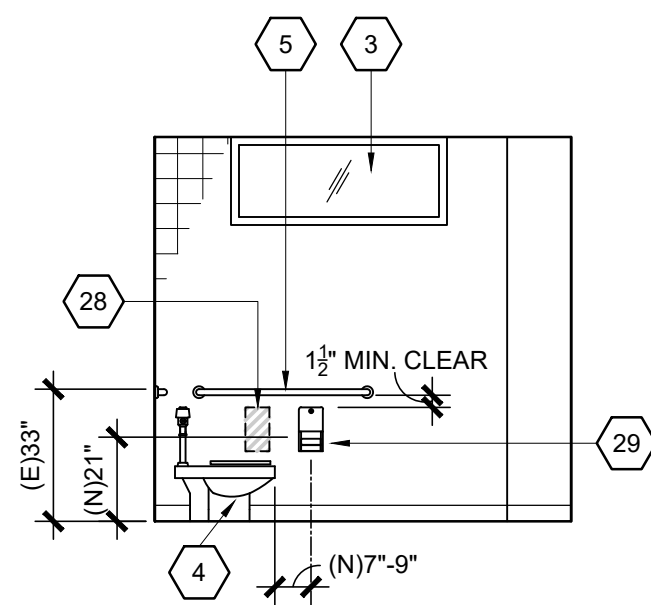
3A ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113218



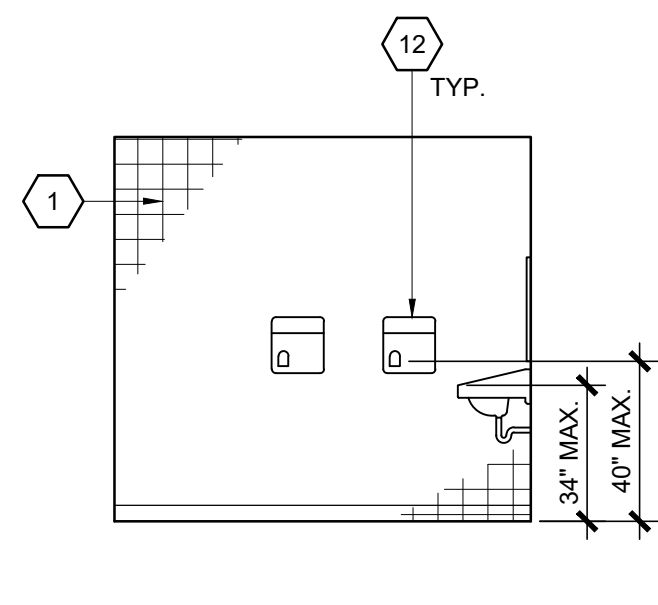
4 ELEVATION
SCALE: 1/4" = 1'-0"
A#



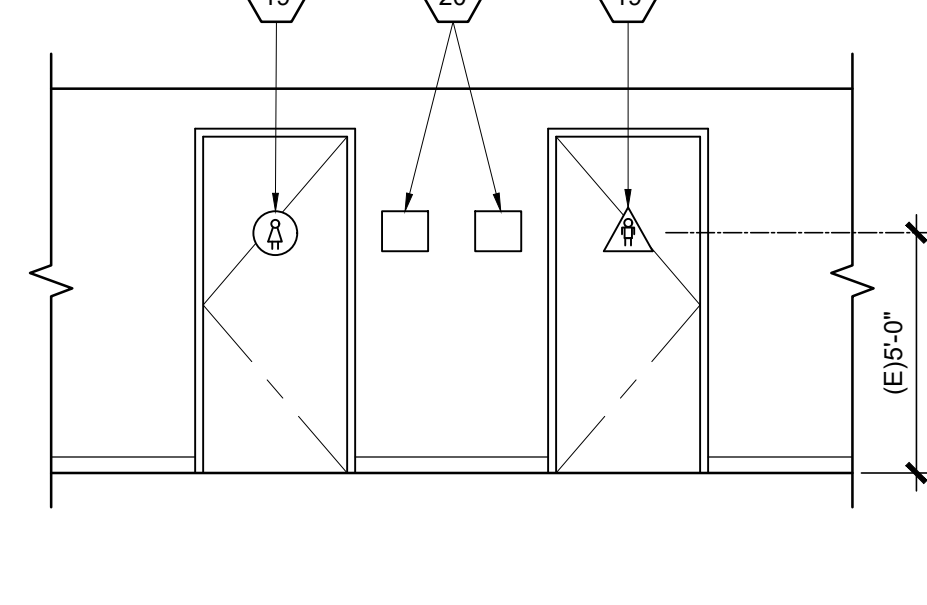
5 ELEVATION
SCALE: 1/4" = 1'-0"
A#



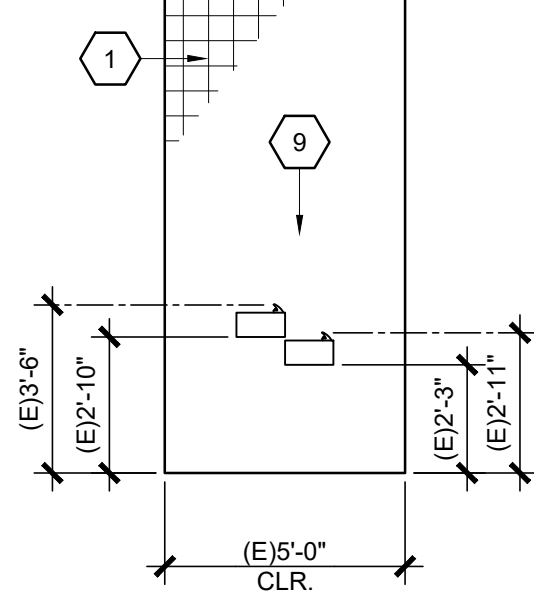
5A ELEVATION
SCALE: 1/4" = 1'-0"
A#



6 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113218



7 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113218



8 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113218

KEYNOTES: 1

- EXISTING CERAMIC TILE TO REMAIN
- EXISTING TOILET PARTITION TO REMAIN
- EXISTING WINDOWS TO REMAIN, CLEAN
- EXISTING ACCESSIBLE WATER CLOSET TO REMAIN (A# 03-113218)
- EXISTING ACCESSIBLE GRAB BARS TO REMAIN (A# 03-113218)
- EXISTING ACCESSIBLE LAVATORY TO REMAIN (A# 03-113218)
- EXISTING ACCESSIBLE URINAL TO REMAIN (A#04-113218)
- EXISTING ACCESSIBLE AMBULATORY STALL TO REMAIN (A#04-113218)
- EXISTING ACCESSIBLE HIGH/LOW DRINKING FOUNTAIN TO REMAIN (A# 03-113218)
- EXISTING TOILET SEAT COVER DISPENSER TO REMAIN
- EXISTING SOAP DISPENSER TO REMAIN
- EXISTING ELECTRIC HAND DRYER TO REMAIN
- EXISTING STANDARD LAVATORY TO REMAIN
- EXISTING STANDARD WATER CLOSET TO REMAIN
- EXISTING STANDARD URINAL TO REMAIN
- EXISTING MIRROR TO REMAIN
- EXISTING 36" W. DOOR TO REMAIN
- REMOVE AND REPLACE EXISTING WALL AND DOOR SIGNAGE, RE: A3.1
- REMOVE AND REPLACE EXISTING DOOR SIGNAGE, RE: A3.1
- REMOVE AND REPLACE EXISTING WALL SIGNAGE, RE: A3.1
- NOT USED
- REMOVE AND SALVAGE EXISTING RECESSED NAPKIN DISPOSAL
- REMOVE AND SALVAGE EXISTING ACCESSIBLE SEMI-RECESSED TOILET PAPER DISPENSER
- REMOVE FULL 4" X 4" CERAMIC TILE AT REMOVED ACCESSORY
- REMOVE EXISTING 4" X 4" CERAMIC TILE AND WALL BOARD AS REQUIRED FOR RELOCATED ACCESSORY
- REMOVE AND REDUCE EXISTING TOILET STALL DOOR TO 34" W., RE-INSTALL
- REMOVE EXISTING TOILET STALL DOORS AND PARTITIONS. REDUCE PARTITIONS TO PROVIDE NOTED NEW DEPTH DIMENSIONS, RE-INSTALL AND PATCH FLOOR CERAMIC TILE
- PATCH AND REPAIR WALL AND CERAMIC TILE TO MATCH EXISTING
- RE-INSTALL SALVAGED ACCESSIBLE SEMI-RECESSED TOILET PAPER DISPENSER
- RE-INSTALL SALVAGED RECESSED NAPKIN DISPENSER
- NEW 12" W. MINIMUM RESIN TOILET PARTITION TO MATCH EXISTING
- NOT USED
- 30" X 48" CLEAR SPACE
- 48" X 60" CLEAR SPACE
- 54" X 60" CLEAR SPACE
- 5" DIA. TURNING RADIUS

MOUNTING HEIGHTS AND CLEARNCES

Alternative Dimensions for Children's Use	
User Group	Adult
Toilet Offset	17"-18"
Toilet Seat Height	17"-19"
Top of Grab Bar	33"-36"
Toilet Paper Dispenser Outlet	19" min.
Furthest T.P. Dispenser in front of W. C.	7'-9" centerline
Lav/Sink Rim Height	34" max.
Lav/Sink Knee Clearance	27" min. - 29" min. @apron for Lav.
Urinal Height	17" max.
Urinal Projection	13-1/2" min.
Urinal Flush Control Height	44" max.
High Drinking Fountain Spout Height	38"-43"
Low Drinking Fountain approach, Spout Height and Spout location from Front Edge of the Unit including Bumpers	Front approach per 11B-306, 36" max. A.F.F., 5" max. from front of unit
Drinking Fountain Operating Parts	6" max. fron front edge of unit
Canilever Drinking Fountain Projection	18"-19"
Toe Clearance at Toilet Partition	9" min.
Shelf Height	40"-48"
Mirror Height (Bottom Edge of Reflecting Surface)	40" max. (above lav. Or counter top), 35" max. (not above lav. Or counter top)
Mirror Height (Bottom Edge of Reflecting Surface) in dressing, fitting & locker rooms	20" Max.

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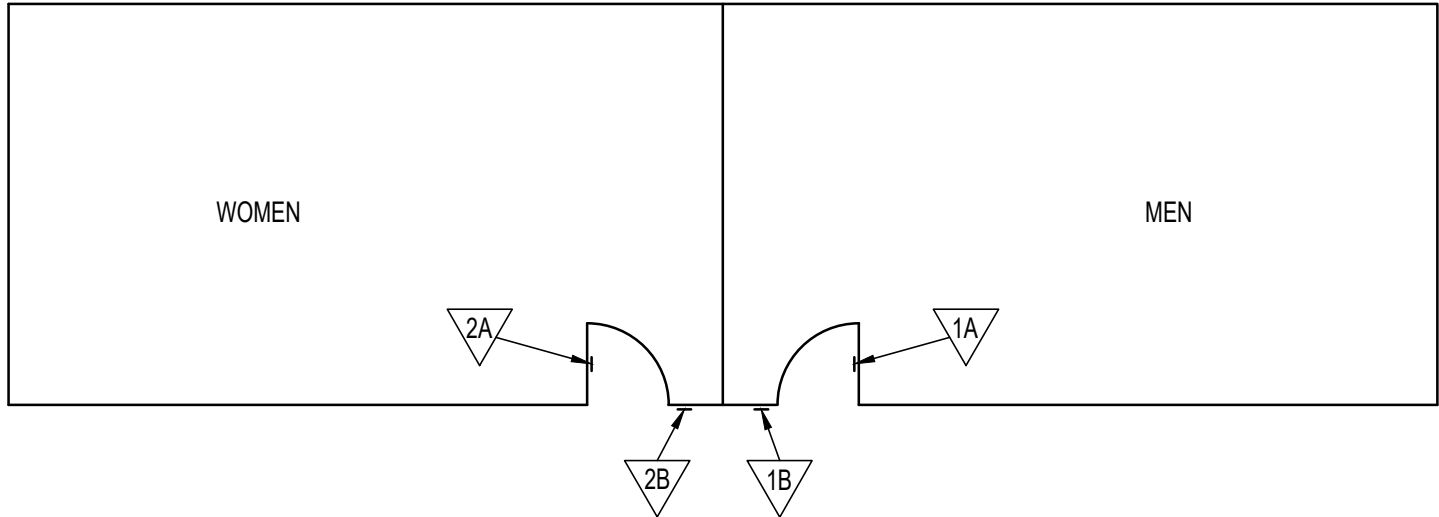
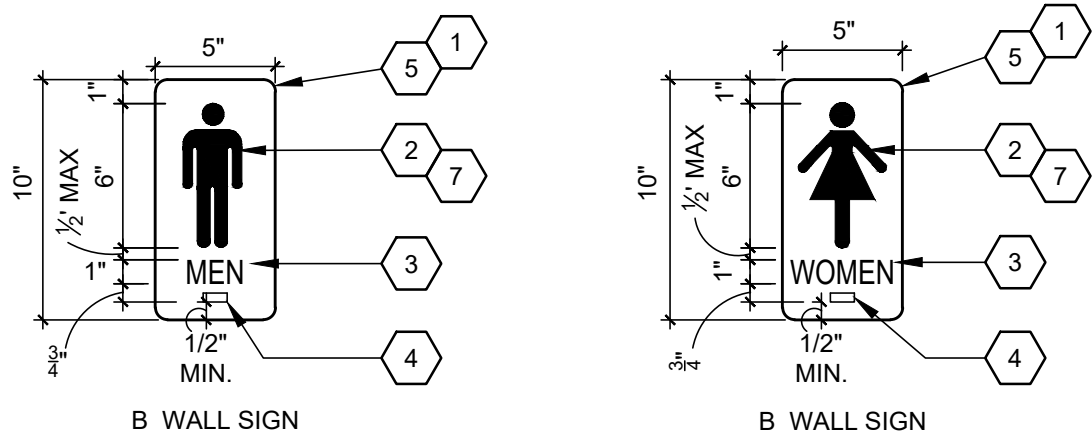
REVISION: 1 DATE: _____
REVISION: 2 DATE: _____

DRAWING TITLE:

ENLARGED TOILET
FLOOR PLAN &
ELEVATIONS

DRAWING NO.:

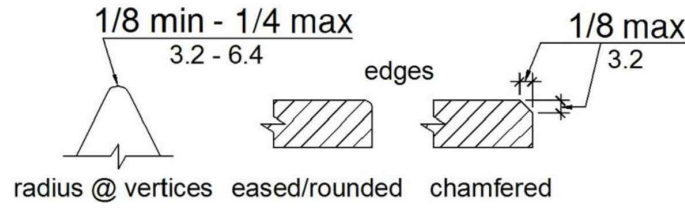
A2.1



2 SIGNAGE PLAN

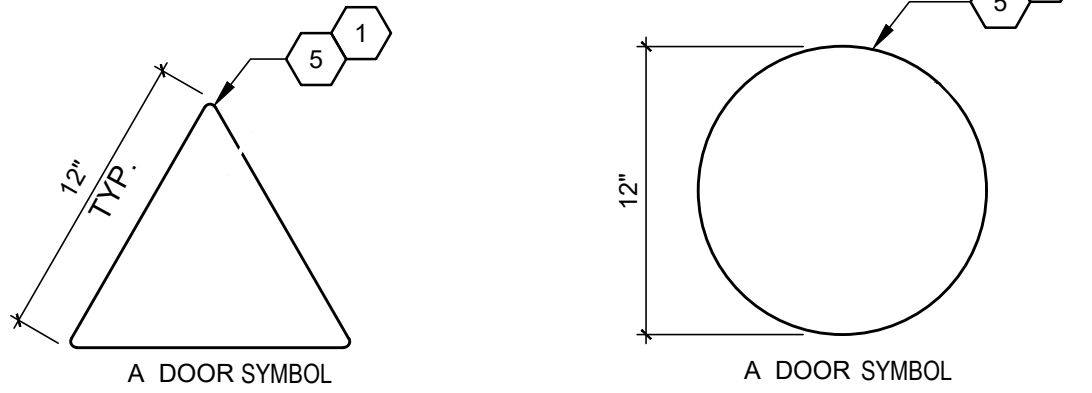
SCALE: N.T.S.

EDGES SHALL BE EASED OR ROUNDED AT $\frac{1}{16}$ " MIN., OR CHAMFERED AT $\frac{1}{8}$ " MAX. VERTICES SHALL BE RADIUSSED BETWEEN $\frac{1}{8}$ " MIN AND $\frac{1}{4}$ " MAX.



3 SIGN DETAIL

SCALE: N.T.S.



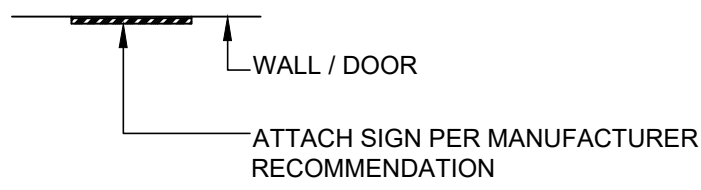
1 MALE TOILET

2 FEMALE TOILET

1 SIGNAGE TYPES

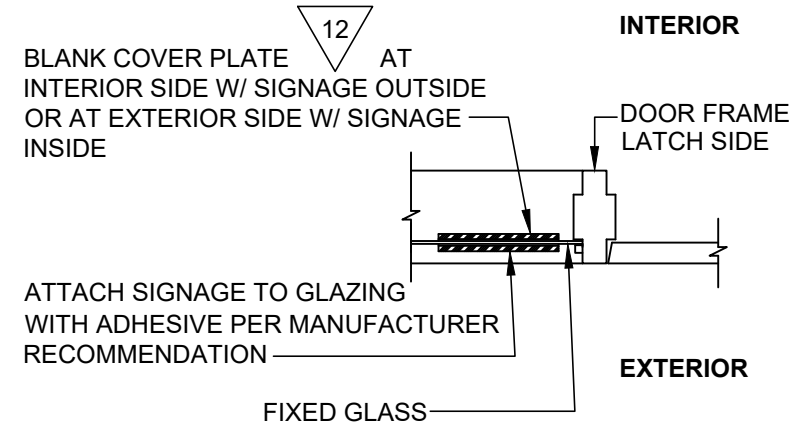
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MOUNTING DETAILS



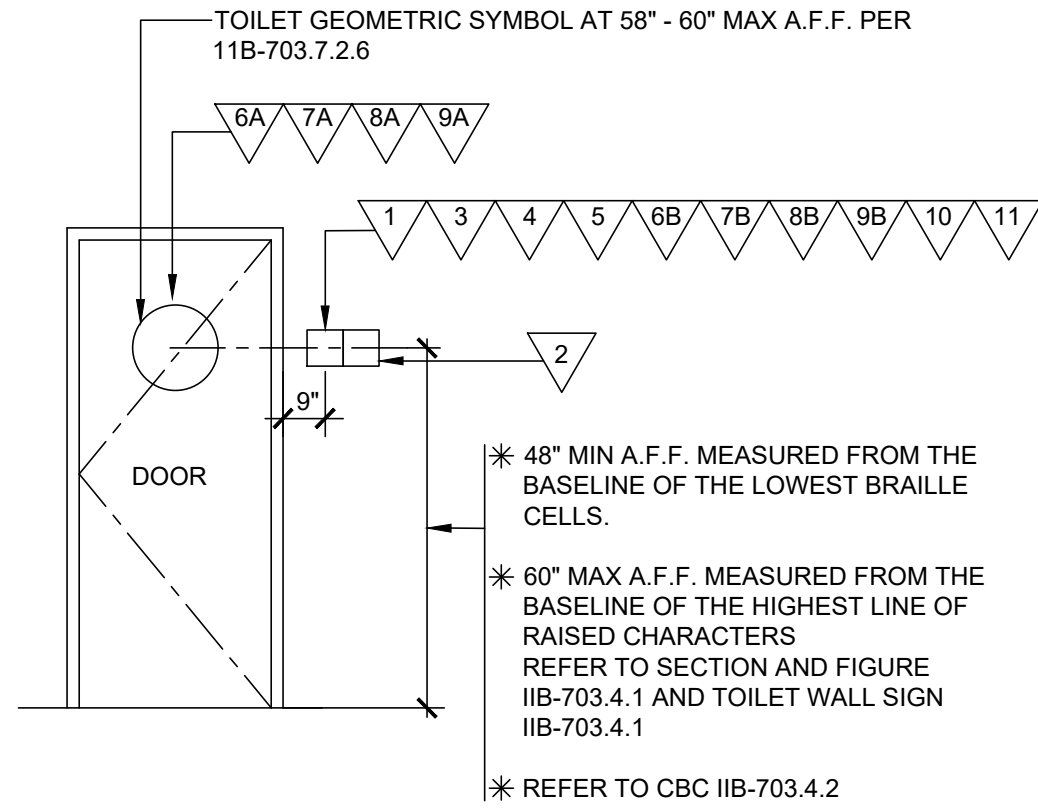
4 WALL OR DOOR MOUNTED SIGNS

SCALE: 1 1/2" = 1'-0"



5 GLASS MOUNTED SIGNS

SCALE: 1 1/2" = 1'-0"



6 DOOR SIGNAGE LOCATIONS

SCALE: NO SCALE

GENERAL NOTES

REFER TO DRAWING A1.1 FOR SIGN LOCATIONS

KEYNOTES

- EDGES SHALL BE EASED OR ROUNDED AT $\frac{1}{16}$ " MIN, OR CHAMFERED AT $\frac{1}{8}$ " MIN., RE: 3/A3.1
- RAISED PICTORIAL SYMBOL, 6" HIGH MIN & RAISED $\frac{1}{32}$ " MINIMUM, COLOR TO BE DARK BLUE
- RAISED TEXT, RAISED $\frac{1}{32}$ " MINIMUM, TEXT TO MATCH FLOOR PLAN, RE: 2/A3.1
- CALIFORNIA BRAILLE, CONTRACTED GRADE 2, REFER TO TABLE IIB-703.3.1
- RADIUS CORNER TYPICAL, $\frac{1}{8}$ " MIN. AND $\frac{1}{4}$ " MAX, RE: 3/A3.1
- 6" HIGH INTERNATIONAL SYMBOL OF ACCESSIBILITY (ISA) SYMBOL TO BE DARK BLUE, BACKGROUND TO BE YELLOW
- BACKGROUND TO BE COLOR YELLOW

GENERAL SIGNAGE REQUIREMENTS

CODE REQUIREMENTS:

- FLOOR LEVEL EXIT SIGNS: PER CBC 11B-216.6 AND 1011.7
- GENERAL REQUIREMENTS: PER CBC 11B-216.1 AND 11B-703.1
- SYMBOLS OF ACCESSIBILITY: PER CBC 11B-703.7.2
- TACTILE EXIT SIGNS: PER CBC 1011.4
- ASSISTIVE LISTENING SYSTEM SIGNAGE: PER CBC 11B-219.2

SIGN CONSTRUCTION AND SIZE:

- SIGN CONSTRUCTION: PLASTIC WITH MILLED TEXT, SYMBOLS AND BRAILLE. CHEMICALLY WELDED R ADHESIVE APPLIED TEXT, SYMBOLS AND/OR BRAILLE IS NOT ACCEPTABLE.
- FINISH AND CONTRAST: TEXT, SYMBOLS AND THEIR BACKGROUND SHALL HAVE A NON-GLARE FINISH. TEXT AND SYMBOLS SHALL HAVE CONTRAST WITH THEIR BACKGROUND PER 11B-703.5.1 FOR VISUAL CHARACTERS; 11B-703.6.2 FOR PICTOGRAMS; 11B-703.7.1 FOR SYMBOLS OF ACCESSIBILITY.
- SIZES OF SIGNS SHALL BE AS DETAILED PER DRAWING A3.1.

PICTORIAL SYMBOLS FOR RESTROOMS AND VISUAL CHARACTERS:

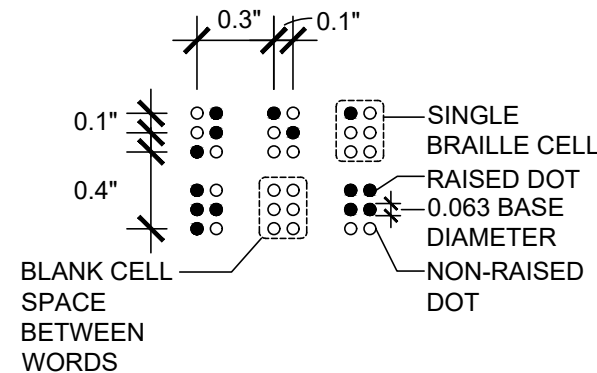
- TYPE: RAISED $\frac{1}{32}$ " MINIMUM
- HEIGHT: 6" MINIMUM
- TEXT DESCRIPTORS: TEXT SHALL BE LOCATED DIRECTLY BELOW THE PICTOGRAM FILED AND SHALL COMPLY WITH TACTILE TEXT CHARACTERS AND BRAILLE REQUIREMENTS THIS PAGE
- VISUAL CHARACTERS SHALL COMPLY WITH CBC SECTION IIB-703.5 AND SHALL BE 40" MIN. ABOVE FINISH FLOOR OR GROUND
- PICTOGRAMS SHALL COMPLY WITH CBC SECTION IIB-703.6
- SYMBOLS OF ACCESSIBILITY SHALL COMPLY WITH CBC SECTION IIB-703.7
- VARIABLE MESSAGE SIGNS SHALL COMPLY WITH CBC SECTION IIB-703.8

TACTILE TEXT CHARACTERS REQUIREMENTS:

- TYPE: UPPER CASE, SANS SERIF PER 11B-703.2.3, NO ITALIC, OBLIQUE, SCRIPT, HIGHLY DECORATIVE OR UNUSUAL FORMS PER 11B-703.2.2 AND 11B-703.2.3
- RAISED CHARACTERS: $\frac{1}{32}$ " MINIMUM PER 11B-703.2
- CHARACTER PROPORTIONS: WIDTH OF THE UPPERCASE "O" IS 60 PERCENT MINIMUM AND 110 PERCENT. MAXIMUM OF HEIGHT OF THE UPPERCASE LETTER "I" PER 11B-703.2.4
- STROKE THICKNESS: UPPERCASE LETTER "I" SHALL BE 15 PERCENT MAXIMUM OF THE HEIGHT OF THE CHARACTER PER 11B-703.2.6
- HEIGHT: $\frac{5}{8}$ " MINIMUM TO 2" MAXIMUM PER 11B-703.2.5
- CHARACTER SPACING: PER 11B-703.2.7 AND IIB-703.2.8, $\frac{1}{8}$ INCH MINIMUM AND 4 TIMES THE RAISED CHARACTER STROKE WIDTH MAXIMUM. CHARACTERS SHALL BE SEPARATED FROM RAISED BORDERS AND DECORATIVE ELEMENTS $\frac{3}{8}$ " MINIMUM
- FORMAT: TEXT SHALL BE IN A HORIZONTAL FORMAT: CBC SECTION IIB-703.2.9

CALIFORNIA BRAILLE REQUIREMENTS:

CONTRACTED CALIFORNIA GRADE 2 BRAILLE AND SHALL COMPLY WITH CBC SECTION IIB-703.3 AND IIB-703.4, RAISED $\frac{1}{40}$ " MINIMUM AND 0.037" MAXIMUM ABOVE THE BACKGROUND, ROUNDED DOTS SHALL BE $\frac{1}{10}$ -INCH ON CENTERS IN EACH CELL WITH $\frac{2}{10}$ -INCH SPACE BETWEEN CELLS, MEASURED FROM THE SECOND COLUMN OF DOTS IN THE FIRST CELL TO THE FIRST COLUMN OF DOTS IN THE SECOND CELL WITH ROUNDED OR DOME TOPS, REFER TO 2019 CBC TABLE 11B-703.3.1 AND FIGURE 11B-703.3.1



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GYMNASIUM HVAC
REPLACEMENT

JOB NUMBER:

12.03.03

DATE: 09/17/2021

REVISION:

DATE: _____

REVISION:

DATE: _____

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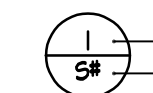
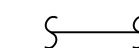
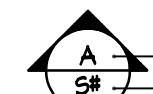

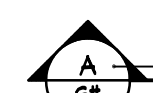
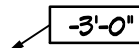
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LEGEND

AB. BLKS.	ANCHOR BOLT BLOCKING BEAM	H.A.B. H.D.	HEADED ANCHOR BOLT HOLD DOWN
BM.	BOUNDARY NAILING	HORIZ.	HORIZONTAL
B.N.	BOUNDARY NAILING	H.S.A.	HEADED STUD ANCHOR
B.O.B.	BOTTOM OF BEAM	H.S.B.	HOLLOW STRUCTURAL BOLT
B.S.	BOUNDARY SCREW	H.S.S.	HOLLOW STRUCTURAL SECTION
C.	CAMBER	JST.	JOIST
C.B.	CARRIAGE BOLT	LT. WIT.	LIGHT WEIGHT
C.L.R.	CLEAR	M.A.S.	MASONRY
C.J.	CONSTRUCTION JOINT	M.B.	MACHINE BOLT
C.N.	CONT. NAILING	(N)	NEH
COL.	COLUMN	N.S.	NEAR SIDE
CONC.	CONCRETE	N.T.S.	NOT TO SCALE
CONN.	CONNECTION	O.C.	ON CENTER
CONT.	CONTINUOUS	O.H.	OPPOSITE HAND
C.P.	COMPLETE PENETRATION	OFNG.	OPENING
C.P.E.	CONT. PANEL EDGES	P.J.	FOUR JOINT
D.B.A.	DEFORMED BAR ANCHOR	PLT.	PLATE
DBL.	DOUBLE	PLYND.	PLYWOOD
D.B.	DRAG BAR	P.T.	PRESSURE TREATED
DIA.	DIAMETER	REGD.	REQUIRED
DO.	DITTO	REM.	REMAINDER
DRNG.	DRAWING	R.S.	ROUGH SAWN
EA.	EACH	SHTG.	SHEATHING
ELEV.	ELEVATION	S.J.	SEPARATION JOINT
(E)	EXISTING	SQ.	SQUARE
E.J.	EXPANSION JOINT	SIM.	SIMILAR
E.N.	EDGE NAILING	S.M.	SHEET METAL
E.S.	EDGE SCREW	S.P.	SEE PLAN
EQ.	EQUAL	STAGG.	STAGGERED
EXT.	EXTERIOR	STD.	STANDARD
FDN.	FOUNDATION	STL.	STEEL
F.G.	FINISH GRADE	STL. JST.	STEEL JOIST
F.H.H.S.	FLAT HEAD NOOD SCREWS	T.B.	TOP AND BOTTOM
F.N.	FIELD NAILING	T.O.C.	TOP OF CONCRETE
F.O.C.	FACE OF CONCRETE	T.O.M.	TOP OF MASONRY
F.O.M.	FACE OF MASONRY	T.O.M.D.	TOP OF METAL DECK
F.O.S.	FACE OF STUD	T.O.P.	TOP OF PLYWOOD
F.S.	FAR SIDE	T.O.PAR.	TOP OF PARAPET
FRMG.	FRAMING	T.O.S.	TOP OF STEEL
FTG.	FOOTING	T.S.	TUBE STEEL
GALV.	GALVANIZED	TYP.	TYPICAL
GA.	GAUGE	U.N.O.	UNLESS NOTED OTHERWISE
GLB.	GLUE LAMINATED BEAM	VERT.	VERTICAL
GYP. BD.	GYPSPUM BOARD	W.P.L.	WELDED PLANE JOINT
		W.W.F.	WELDED WIRE FABRIC
		W.O.	WHERE OCCURS

	DETAIL REFERENCE DETAIL NUMBER SHEET NO. WHERE DRAWN		STEP FOOTING
	WALL ELEVATION WALL ELEVATION LETTER SHEET NO. WHERE DRAWN		REFERENCE ELEVATION
	WALL SECTION WALL SECTION LETTER SHEET NO. WHERE DRAWN		REFERENCE ELEVATION TO TOP OF FOOTING

SPECIAL INSPECTION (STEEL):

- SPECIAL INSPECTION OF FABRICATORS PER SECTION 1705A.2.
- INSPECTION OF ALL SHOP AND FIELD WELDING OPERATIONS, INCLUDING THE INSTALLATION OF AUTOMATIC END WELDED STUD SHEAR CONNECTORS, SHALL BE MADE BY AN AWS-CERTIFIED WELDING INSPECTOR APPROVED BY THE ENFORCEMENT AGENCY AS DEFINED IN SECTION 1705A.2.5.
- SPECIAL INSPECTION FOR SPRAYED FIRE-RESISTANT MATERIALS PER SECTION 1705A.14.
- SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION SHALL BE AS DEFINED IN C.B.C. SECTION 1705A.2 AND TABLE 1705A.2.1 BELOW AND AS NOTED ON THE CONSTRUCTION DOCUMENTS.

REQUIRED SPECIAL INSPECTION AND TEST OF STEEL CONSTRUCTION (TABLE 1705A.2.1)					
TYPE	CONTINUOUS SPEC. INSP.	PERIODIC SPEC. INSP.	REFERENCED STANDARD ^a	C.B.C. REFERENCE	
1. MATERIAL IDENTIFICATION AND TESTING OF HIGH STRENGTH BOLTS, NUTS AND WASHERS:					
a. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	---	X	RCS: 15, AISC 360: A3.3, J3.1 AND APPLICABLE ASTM MATERIAL STANDARDS	2202A.1, [DSA-55/CC] 2202.1	
b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	---	X	RCS: 15 & 2.1, AISC 360: A3.3 & NS.2	---	
c. TESTING OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS.	---	---	RCS: 12 APPLICABLE ASTM MATERIAL STANDARDS	---	
2. INSPECTION OF HIGH-STRENGTH BOLTING:					
a. SNUG-TIGHT JOINTS.	---	X			
b. PRETENSIONED AND SLIP-CRITICAL JOINTS USING TURN-OF-NUT WITH MATCH-MARKING, TWIST-OFF BOLT OR DIRECT TENSION INDICATOR METHODS OF INSTALLATION.	---	X	RCS: 7-9, AISC 360: J3.1, J3.2, M2.3 & N5.6	1705A.2.6, 2204A.2, [DSA-55/CC] 2212.6.1	
c. PRETENSIONED AND SLIP-CRITICAL JOINTS USING TURN-OF-NUT WITHOUT MATCH-MARKING OR CALIBRATED WRENCH METHODS OF INSTALLATION.		X	---	---	
3. MATERIAL IDENTIFICATION AND TESTING OF STRUCTURAL STEEL AND COLD-FORMED STEEL DECK:					
a. FOR STRUCTURAL STEEL, IDENTIFICATION MARKINGS TO CONFORM TO AISC 360.	---	X	ASC 360: A3.1	2202A.1, [DSA-55/CC] 2202.1	
b. FOR OTHER STEEL, IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	---	X	APPLICABLE ASTM MATERIAL STANDARDS	2202A.1, [DSA-55/CC] 2202.1	
c. MANUFACTURER'S CERTIFIED TEST REPORTS.	---	---	ASC 360: A3.1 & N5.2	---	
d. TESTING OF UNIDENTIFIED STEEL.	---	X	APPLICABLE ASTM MATERIAL STANDARDS	2202A.1, [DSA-55/CC] 2202.1	
4. MATERIAL IDENTIFICATION OF WELDING CONSUMABLES AND TESTING OF WELDED ELEMENTS:					
a. STRUCTURAL STEEL AND COLD-FORMED STEEL DECK.	---	X	ASC 360: A3.3 & NS.2 AND APPLICABLE AWS AS DOCUMENTS	---	
b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	---	X	ASC 360: NS.2	---	
c. NONDESTRUCTIVE TESTING OF WELDED JOINTS.	---	---	ASC 360: NS.3	---	
5. INSPECTION OF WELDING:					
a. STRUCTURAL STEEL AND COLD-FORMED STEEL DECK:					
1. COMPLETE AND PARTIAL JOINT PENETRATION GROOVE WELDS.	X	---	ASC 360: J2, M2.4, & M4.5, AWS D1.1 AWS D1.8	1705A.2.1, 1705A.2.5	
2. MULTIPASS FILLET WELDS.	X	---			
3. SINGLE-PASS FILLET WELDS LARGER THAN 5/16".	X	---			
4. FLUGS AND SLOT WELDS.	---	X			
5. SINGLE-PASS FILLET WELDS LESS THAN OR EQUAL TO 5/16".	---	X			
6. FLOOR AND ROOF DECK WELDS.	---	X	AWS D1.3, SD1 GA/GC	1705A.2.1, 1705A.2.2, 1705A.2.5	
7. END-WELDED STUDS.				1705A.2.5, 2218A.2, [DSA-55/CC] 2212.6.2	
8. WELDED SHEET STEEL FOR COLD-FORMED FRAMING MEMBERS.	---	X	AWS D1.1	1705A.2.5, 1705A.2.4.1	
6. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE:					
a. DETAILS SUCH AS BRACING AND STIFFENING.	---	X	ASC 360: NS.8	1705A.2.1	
b. MEMBER LOCATIONS.	---	X			
c. NONDESTRUCTIVE TESTING OF WELDED JOINTS.	---	X			

^a WHERE APPLICABLE, SEE ALSO SECTION 1705A.12, SPECIAL INSPECTION FOR SEISMIC RESISTANCE.

METAL DECKING:

- STEEL MATERIAL FOR THE DECK UNITS SHALL CONFORM TO ASTM A-653.
B) ROOFS-VERCO "VERCOR" OR EQ. h=60,000 P.S.I.
B) ROOFS-VERCO "H.S.B.-36" OR EQ. h=59,000 P.S.I.
B) ROOFS-VERCO "P.L.B.-36" OR EQ. h=39,000 P.S.I.
B) ROOFS-VERCO "N-24" OR EQ. h=39,000 P.S.I.
- ALL DECK UNITS SHALL BE WITH A (660) GALVANIZED COATING FOR INTERIOR NOT EXPOSED TO WEATHER AND (640) FOR EXTERIOR EXPOSED TO WEATHER.
- WELDING SHALL BE WITH E60 OR E70 ELECTRODE AND PERFORMED BY CERTIFIED, LICENSED LIGHT GAUGE WELDER PER AWS D1.3.

SPECIAL INSPECTIONS:

- GENERAL: THE OWNER SHALL EMPLOY ONE OR MORE APPROVED AGENCIES TO PERFORM INSPECTIONS DURING CONSTRUCTION ON THE TYPES OF WORK LISTED UNDER SECTION 1705A. THESE INSPECTIONS ARE IN ADDITION TO THE INSPECTIONS IDENTIFIED IN SECTION 170. THE SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE BUILDING OFFICIAL, FOR THE INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION. REPORT REQUIREMENT: THE INSPECTOR OF RECORD AND SPECIAL INSPECTORS SHALL KEEP RECORDS OF INSPECTIONS. THE INSPECTOR OF RECORD AND SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL, AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE AS REQUIRED BY TITLE 24, PART I. REPORTS SHALL INDICATE THAT WORK INSPECTED WAS OR WAS NOT COMPLETED IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS AS REQUIRED BY TITLE 24, PARTS I AND 2. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION IF THEY ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE PRIOR TO THE COMPLETION OF THAT PHASE OF THE WORK. A FINAL REPORT DOCUMENTING REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED AT A POINT IN TIME AGREED UPON PRIOR TO THE START OF WORK BY THE APPLICANT AND THE BUILDING OFFICIAL.

STRUCTURAL OBSERVATION:

- VISUAL OBSERVATION OF THE STRUCTURAL SYSTEM SHALL BE PROVIDED BY THE STRUCTURAL ENGINEER OF RECORD FOR GENERAL CONFORMANCE TO THE APPROVED CONSTRUCTION DOCUMENTS. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE RESPONSIBILITY FOR THE INSPECTION REQUIRED BY SECTION 170. 1705A OR OTHER SECTIONS OF THE CODE (SECTION: 1702A).
- STRUCTURAL OBSERVATION SHALL BE PROVIDED BY THE STRUCTURAL ENGINEER OF RECORD AT THE FOLLOWING PHASES AS A MINIMUM:
A. UPON COMPLETION OF FOUNDATION REINFORCEMENT, IMMEDIATELY PRIOR TO CONCRETE POUR.
B. ROOF DECK WELDING AND ROOF PLYWOOD NAILING OBSERVATION.
C. ADDITIONAL VISITATION AS DEEMED NECESSARY BY THE STRUCTURAL ENGINEER OF RECORD.
- FOR ALL ITEMS THE CONTRACTOR SHALL NOTIFY THE STRUCTURAL ENGINEER 48 HOURS PRIOR TO COMPLETION OF THE WORK TO BE OBSERVED.

DESIGN LOADS:

- FLOOR AND ROOF DESIGN LOADS:
- ROOF LIVE LOAD (REDUCIBLE PER SECTION 1607A.11) ----- 20 P.S.F.
 - ROOF DEAD LOAD ----- 27 P.S.F.
- WIND DESIGN DATA:
- BASIC WIND SPEED ----- 105 M.P.H. (ULTIMATE)
 - RISK CATEGORY ----- III
 - WIND EXPOSURE ----- C

- SEISMIC DESIGN DATA:
- RISK CATEGORY ----- III
 - SEISMIC IMPORTANCE FACTOR ----- 1.5
 - SITE CLASS ----- D
 - MAPPED SPECTRAL RESPONSE ACCELERATIONS (S_g) ----- 1676
 - MAPPED SPECTRAL RESPONSE ACCELERATIONS (S₁) ----- 0.623
 - SPECTRAL RESPONSE COEFFICIENTS (S_{ps}) ----- 1.340
 - SPECTRAL RESPONSE COEFFICIENTS (S_{ps}) ----- NULL
 - SEISMIC DESIGN CATEGORY (SDC) ----- D
 - SEISMIC DESIGN FORCE (F_p) ----- 3.02M (ULTIMATE)
 - RESPONSE MODIFICATION FACTOR (R) ----- 2.00
 - COMPONENT AMPLIFICATION FACTOR (A_p) ----- 2.50
 - ANALYSIS PROCEDURE: SEISMIC DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

GENERAL:

- ALL CONSTRUCTION SHALL COMPLY WITH THE 2019 C.A.C. TITLE 24, PART I, AND 2019 C.B.C. TITLE 24, PART 2, FOR DSA/SS.
- FRAMING CONDITIONS NOT SPECIFICALLY SHOWN OR INDICATED SHALL BE FRAMED SIMILAR TO DETAILS SHOWN FOR THE RESPECTIVE MATERIALS OR CONDITIONS.
- CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS BEFORE STARTING WORK AND REPORT ANY DISCREPANCIES TO THE ARCHITECT.
- WITHOUT EXCLUSION OF ANY REFERENCE IN THE CONSTRUCTION DOCUMENTS TO ANY RULE OR REGULATION, THE STRUCTURAL ENGINEER IS NOT ASSUMING ANY PROVISIONS OF SUPERVISION OF CONSTRUCTION METHODS OR PROCESSES.
- CHANGES TO THE APPROVED DRAWINGS AND SPECIFICATIONS SHALL BE MADE BY A CONSTRUCTION CHANGE DOCUMENT (CCD) APPROVED BY THE DIVISION OF THE STATE ARCHITECT, AS DEFINED IN 2019 C.A.C. TITLE 24, PART I, SECTION 4-350.

MECHANICAL UNIT FRAMING NOTES

- THE DIMENSIONS FOR THE SUPPORT OF THE MECHANICAL UNITS, EXHAUST FANS, CONDENSING UNITS, ETC., AS SHOWN THE STRUCTURAL DRAWINGS, ARE APPROXIMATE. THE GENERAL CONTRACTOR SHALL COORDINATE THE UNIT TYPE & QUANTITY WITH STRUCTURAL DRAWINGS. NOTIFY THE ARCHITECT OF ANY DISCREPANCY PRIOR TO THE STRUCTURAL STEEL SHOP DRAWING PHASE.
- IT SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO FULLY COORDINATE THE ANGLE SUPPORT FRAME DIMENSIONS (LENGTH AND WIDTH) WHERE THE NEW MECHANICAL UNIT ATTACHES DIRECTLY TO THE ANGLE SUPPORT FRAME. IN ADDITION THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL EXISTING ROOF CONDITIONS AT EACH NEW MECHANICAL UNIT SO AS THE NEW ANGLE SUPPORT FRAME BASE PLATE ATTACHMENTS DO NOT INTERFERE WITH THE EXISTING ROOF RIBS. NOTIFY THE MECHANICAL ENGINEER OF ANY DISCREPANCIES PRIOR TO THE STRUCTURAL STEEL SHOP DRAWING PHASE.
- FURTHER COORDINATION OF THE FIELD WELDED ANGLE FRAME SUPPORTING THE UNIT CURB SHALL BE PROVIDED BY THE GENERAL CONTRACTOR. COORDINATION SHALL BE WITH THE ACTUAL MECHANICAL UNIT CURB DIMENSIONS. THE HEIGHT OF THE SUPPORT FRAME SHALL BE COORDINATED WITHIN THE ROOFING CONTRACTOR AND ARCHITECT, PRIOR TO THE SHOP DRAWINGS PHASE.
- MECHANICAL UNIT SUBSTITUTIONS MAY IMPACT THE ANGLE SUPPORT FRAMING DUE TO UNIT HEIGHT OR SIZE AS SHOWN ON THE MECHANICAL DRAWINGS. ANY COSTS INCURRED FROM ANY SUBSTITUTION MADE BY THE CONTRACTOR WHICH REQUIRES RE-DESIGN OR MODIFICATIONS TO THE CONSTRUCTION DOCUMENTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR MAY WISH TO INQUIRE AS TO THE PROBABLE EXTENT OF THESE COSTS PRIOR TO INTRODUCING A SUBSTITUTION.
- IT SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO COORDINATE AND PROVIDE ALL FLASHING AND ROOFING AS REQUIRED AT ALL MECHANICAL UNIT ROOF ATTACHMENT PENETRATIONS SO AS ROOF WILL BE COMPLETELY SEALED FROM WATER INTRUSION.

STRUCTURAL STEEL:

- STEEL SHAPES SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING A.S.T.M. DESIGNATIONS:
H SHAPES ----- ASTM A-492 GRADE 50
STRUCTURAL SHAPES & PLATES ----- ASTM A-36
PIPE COLUMNS ----- ASTM A-53 GRADE B
STEEL TUBE ----- ASTM A-500 GRADE B
STEEL DECK ----- ASTM A-653 OR A-1063
- STRUCTURAL FASTENERS SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING A.S.T.M. DESIGNATIONS:
HIGH STRENGTH BOLTS ----- ASTM F-3125 GRADE 120
MACHINE BOLTS ----- ASTM A-307 GRADE A
NUTS ----- ASTM A-563
WASHERS ----- ASTM F-436
THREADED RODS ----- ASTM A-36
STEEL HEADED STUD ANCHORS ----- ASTM A-108 GRADE 1010-TO 1020 ANCHOR RODS:
HEADED:
AT STEEL TO CONC./MASONRY ----- ASTM F-1554
AT LUMBER TO CONC./MASONRY ----- ASTM-A307 GRADE A (GALV.)
THREADED & NUTTED:
AT STEEL TO CONC./MASONRY ----- ASTM F-1554
AT LUMBER TO CONC./MASONRY ----- ASTM A-307 GRADE A (GALV.)
- NO STRUCTURAL STEEL SHALL BE FABRICATED OR ERECTED PRIOR TO REVIEW OF SHOP DRAWINGS BY THE STRUCTURAL ENGINEER.
- ALL ERECTION AND FABRICATION SHALL COMPLY WITH THE LATEST EDITION OF THE AISC.
- WELDING SHALL BE PERFORMED ONLY BY CERTIFIED WELDERS. ALL SHOP WELDING SHALL BE DONE IN THE SHOP OF A LOS ANGELES APPROVED FABRICATOR.
- NO FIELD CUTTING OR BURNING OF STRUCTURAL STEEL WILL BE PERMITTED WITHOUT WRITTEN CONSENT OF THE STRUCTURAL ENGINEER.
- WELD FILLER = E70XX
- ALL C.P. AND C.J.F. WELDS TO RECEIVE NON-DESTRUCTIVE WELD TESTING PER DA IR 17-2.
- ALL BOLTS, WASHERS AND NUTS IN CONTACT WITH PRESERVATIVE-TREATED WOOD AND FIRE-RETARDANT-TREATED WOOD IN INTERIOR, EXTERIOR, WET OR DAMP APPLICATIONS SHALL BE HOT DIPPED ZINC-COATED GALVANIZED STEEL PER ASTM A153. ALL OTHER FASTENERS SHALL BE MECHANICALLY DEPOSITED ZINC COATED STEEL PER ASTM A153.

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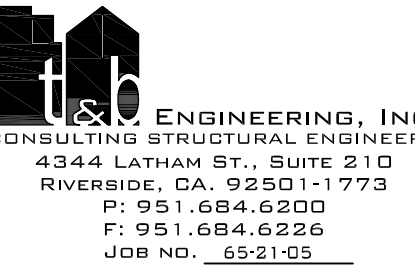
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GYMNASium

JOB NUMBER:

DATE: 2022-01-14

REVISION:

DATE: _____

REVISION:

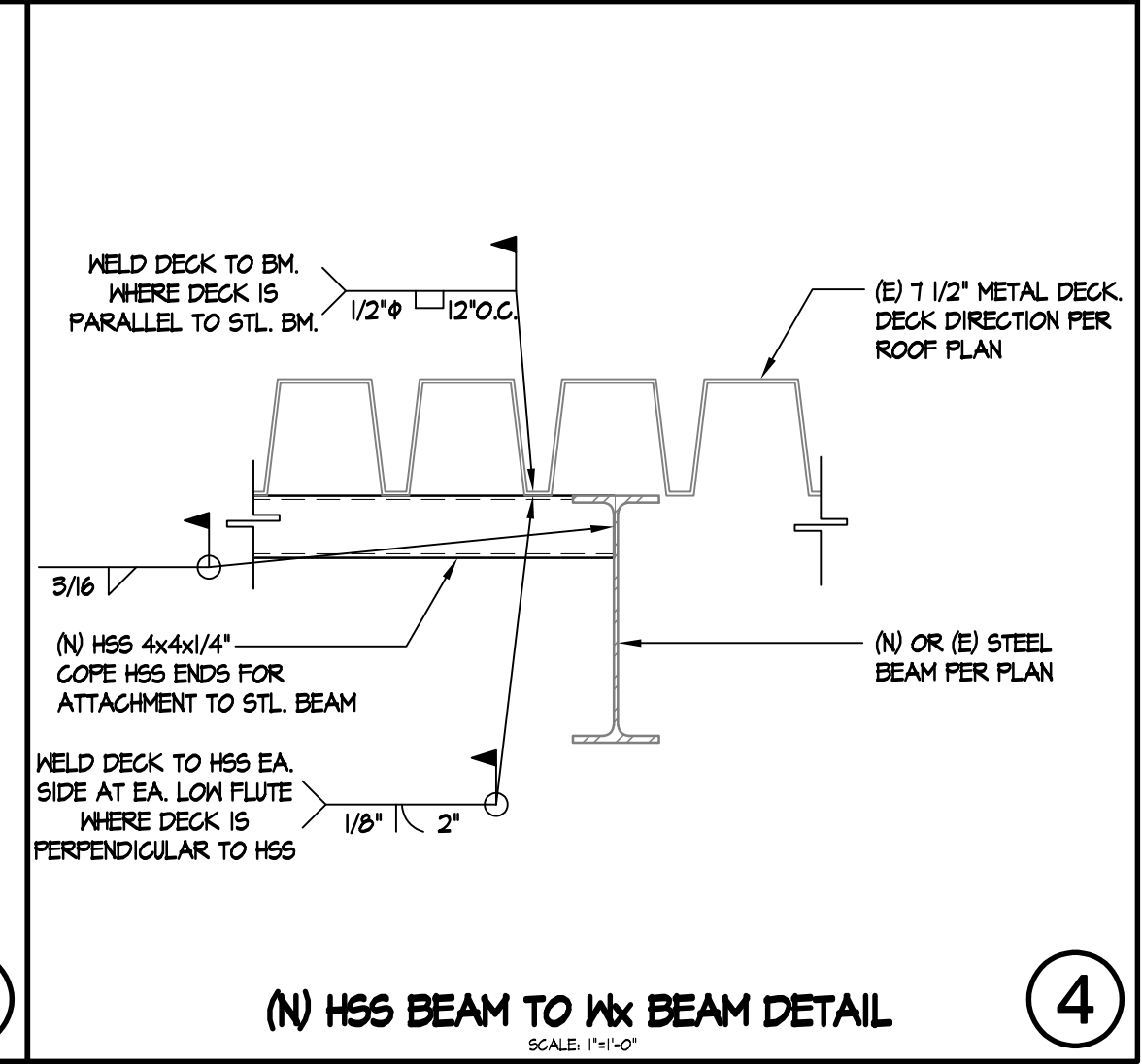
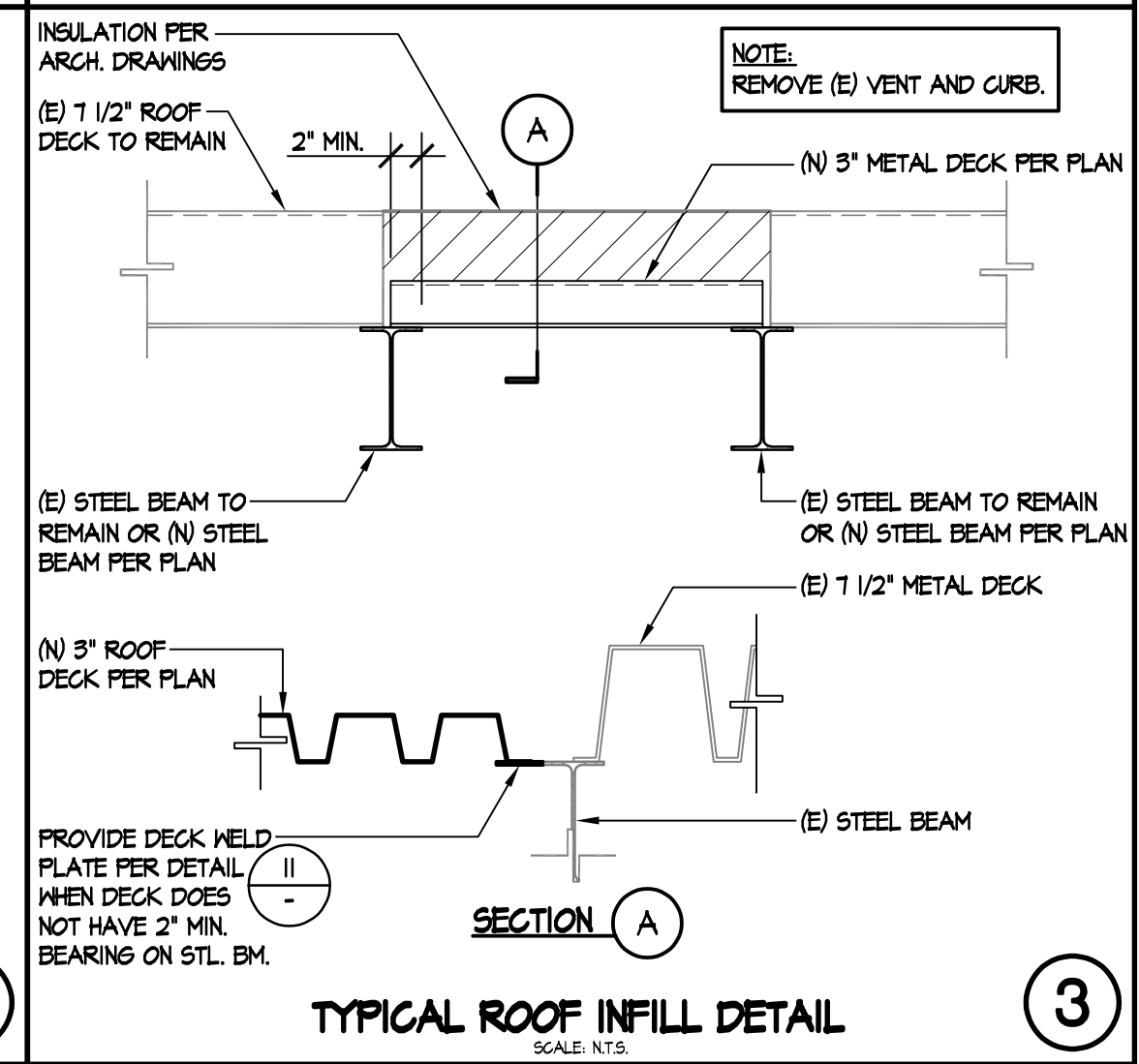
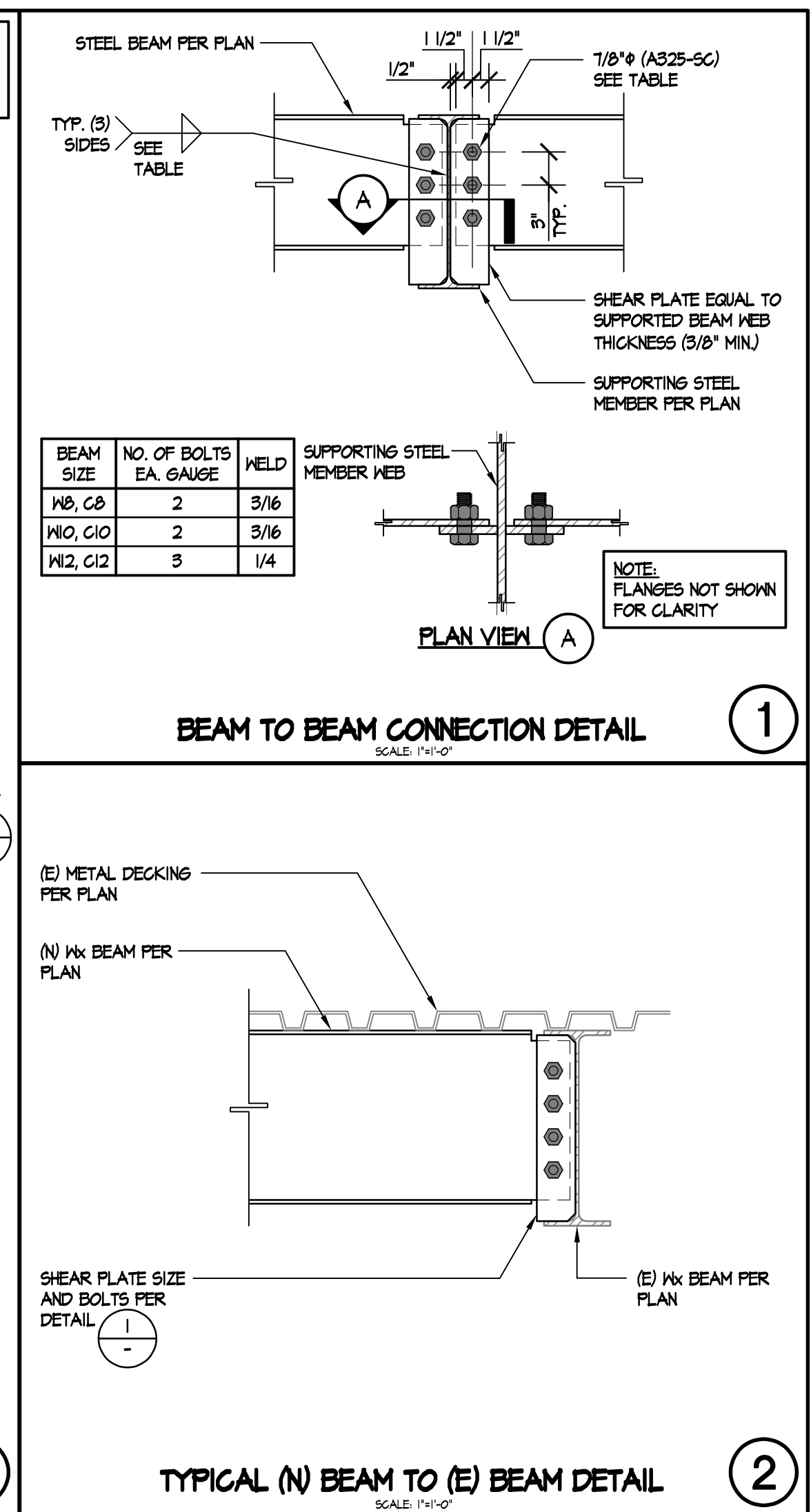
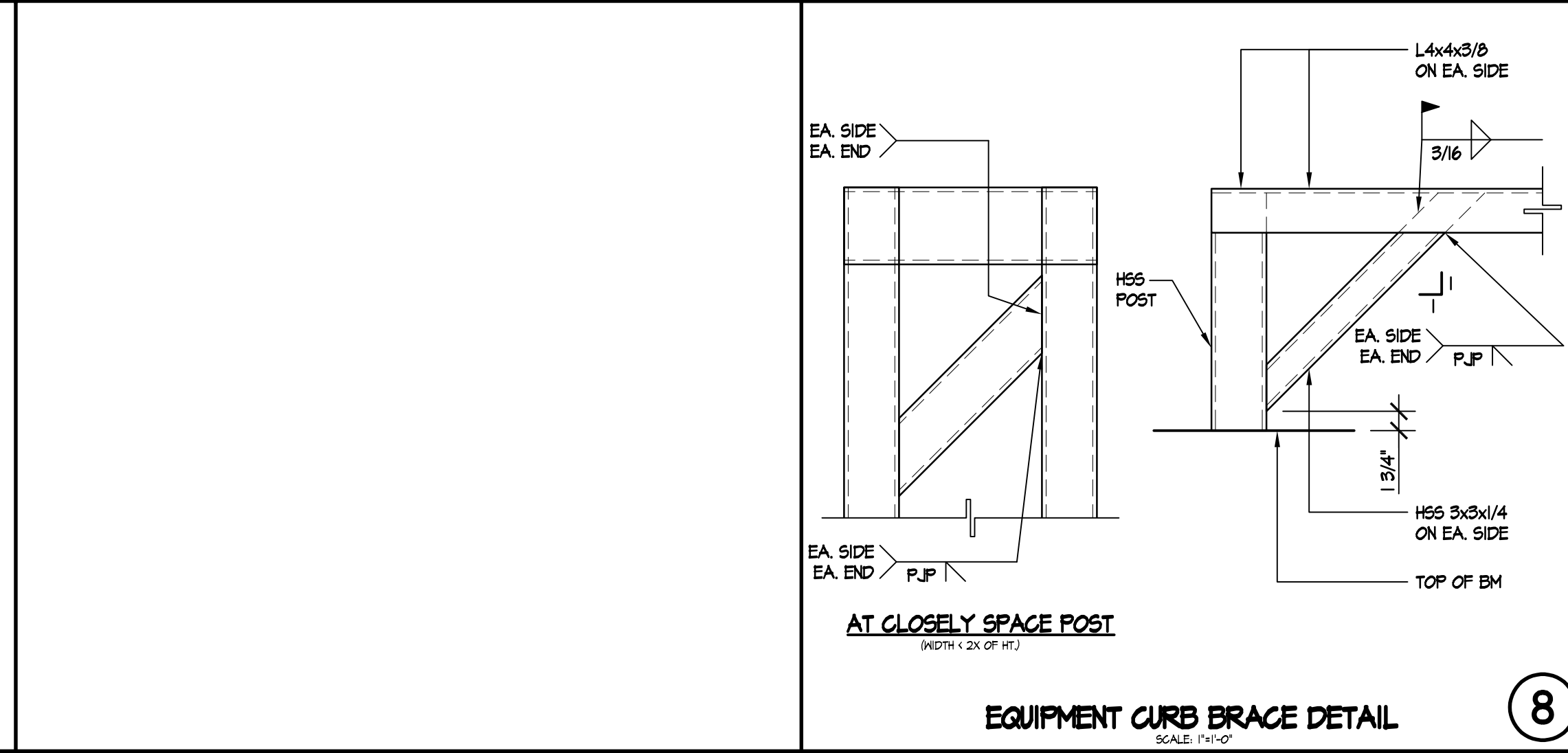
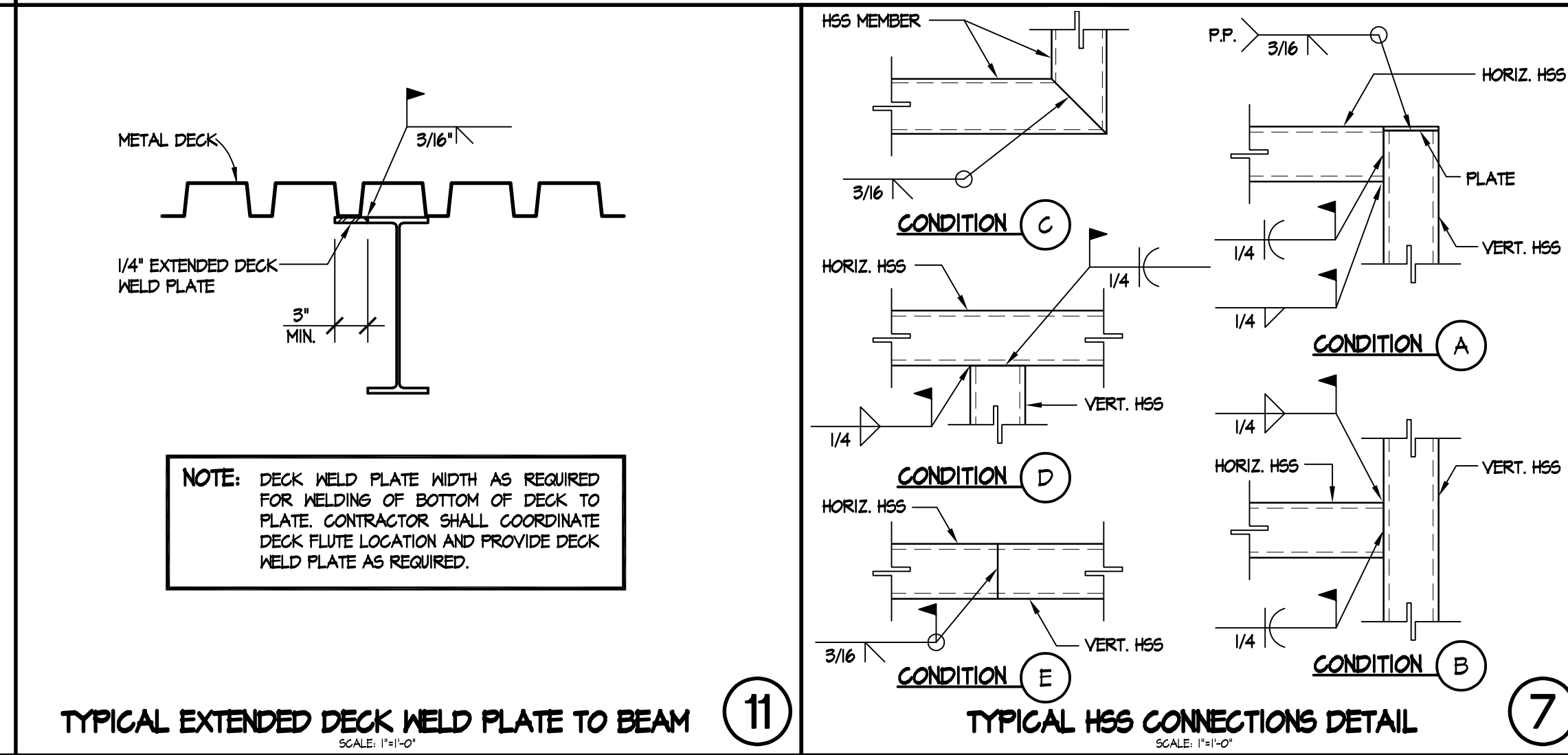
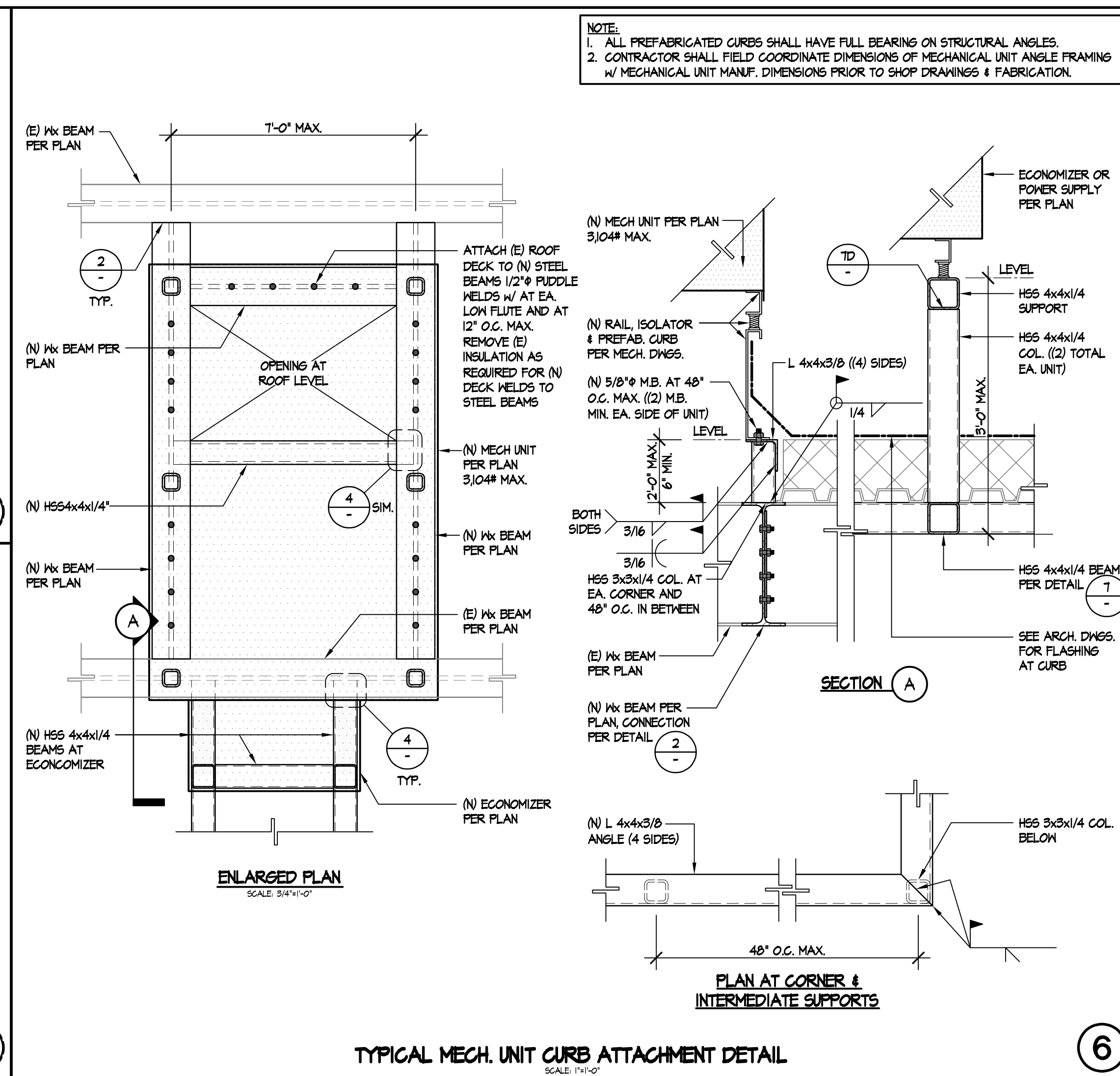
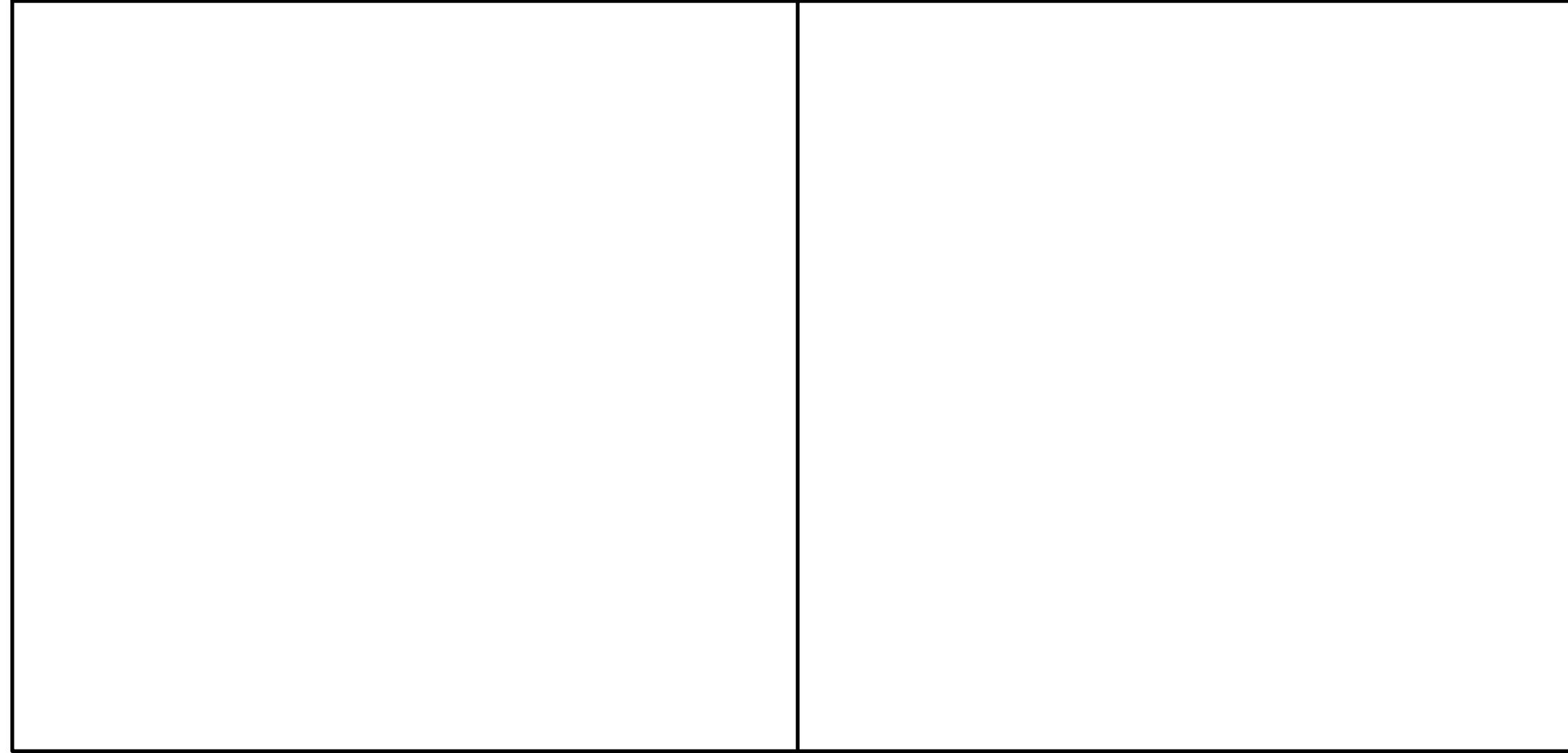
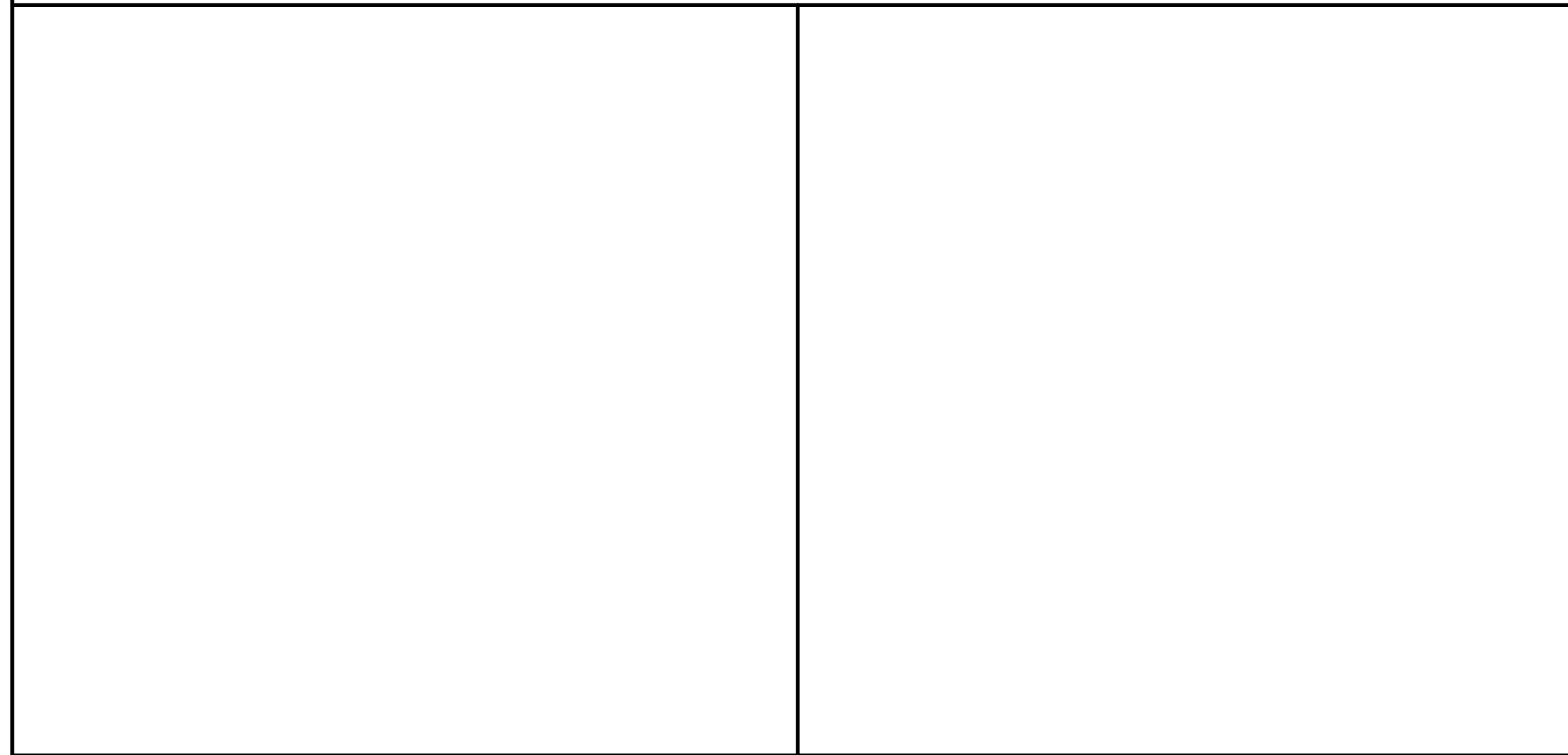
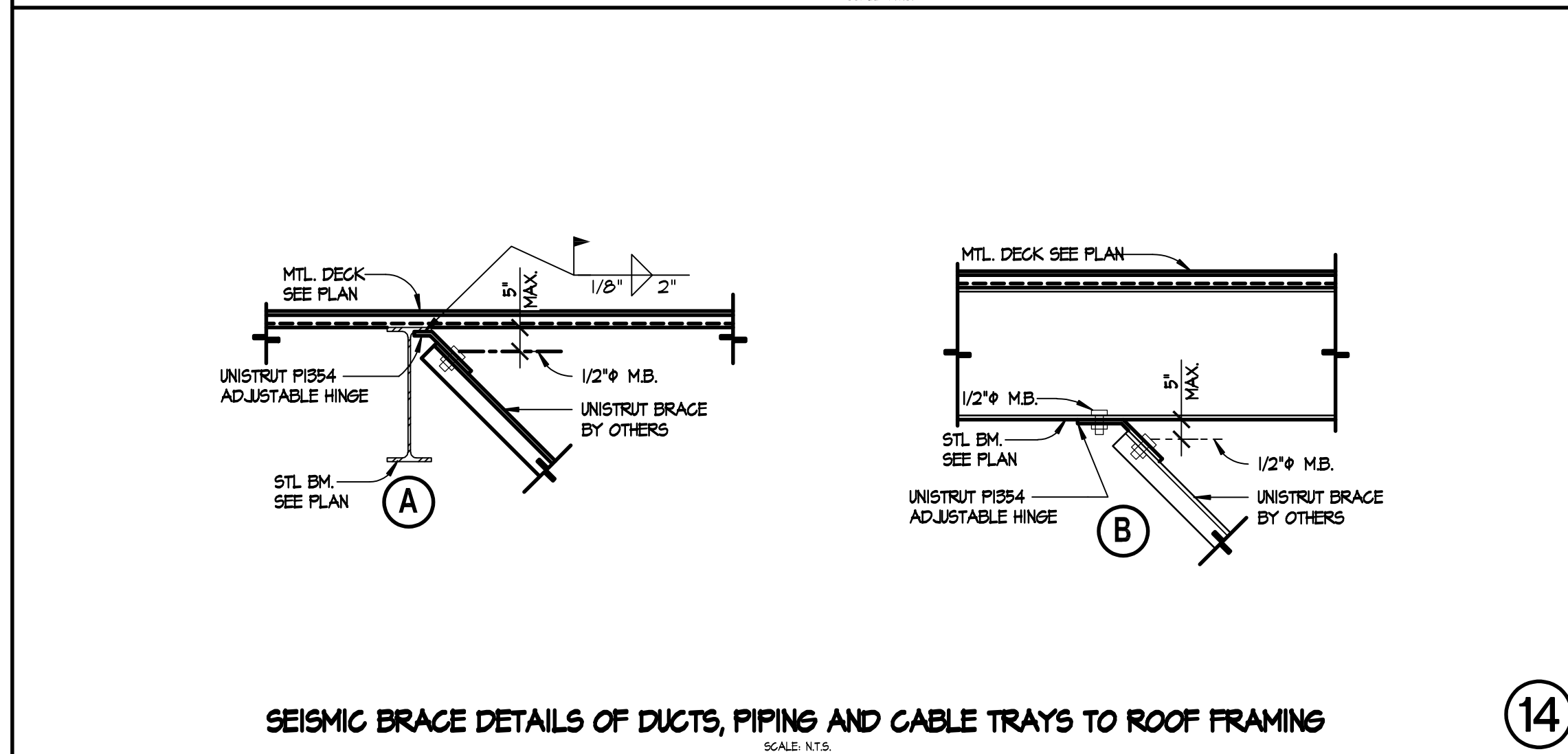
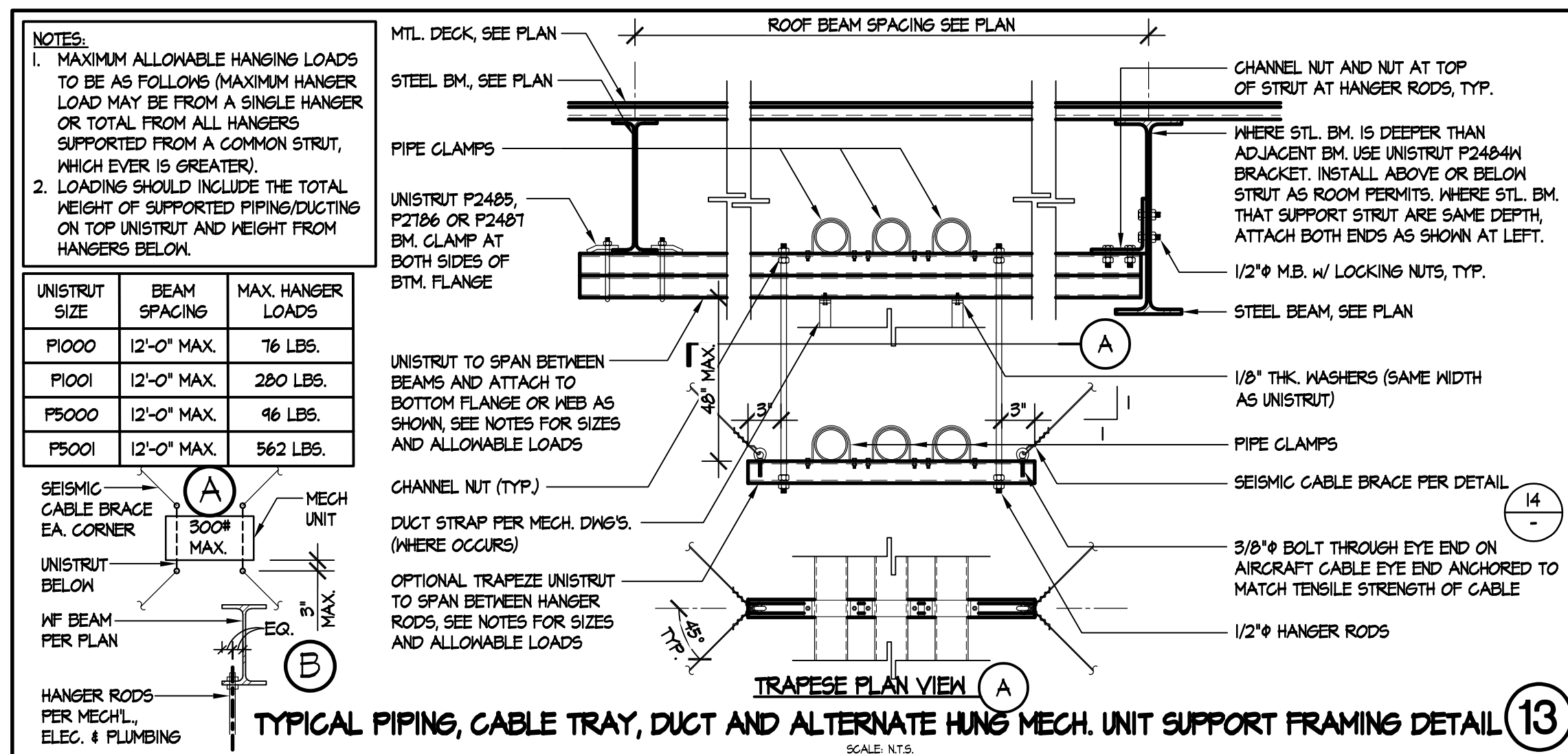
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

DRAWING TITLE:

GENERAL NOTES

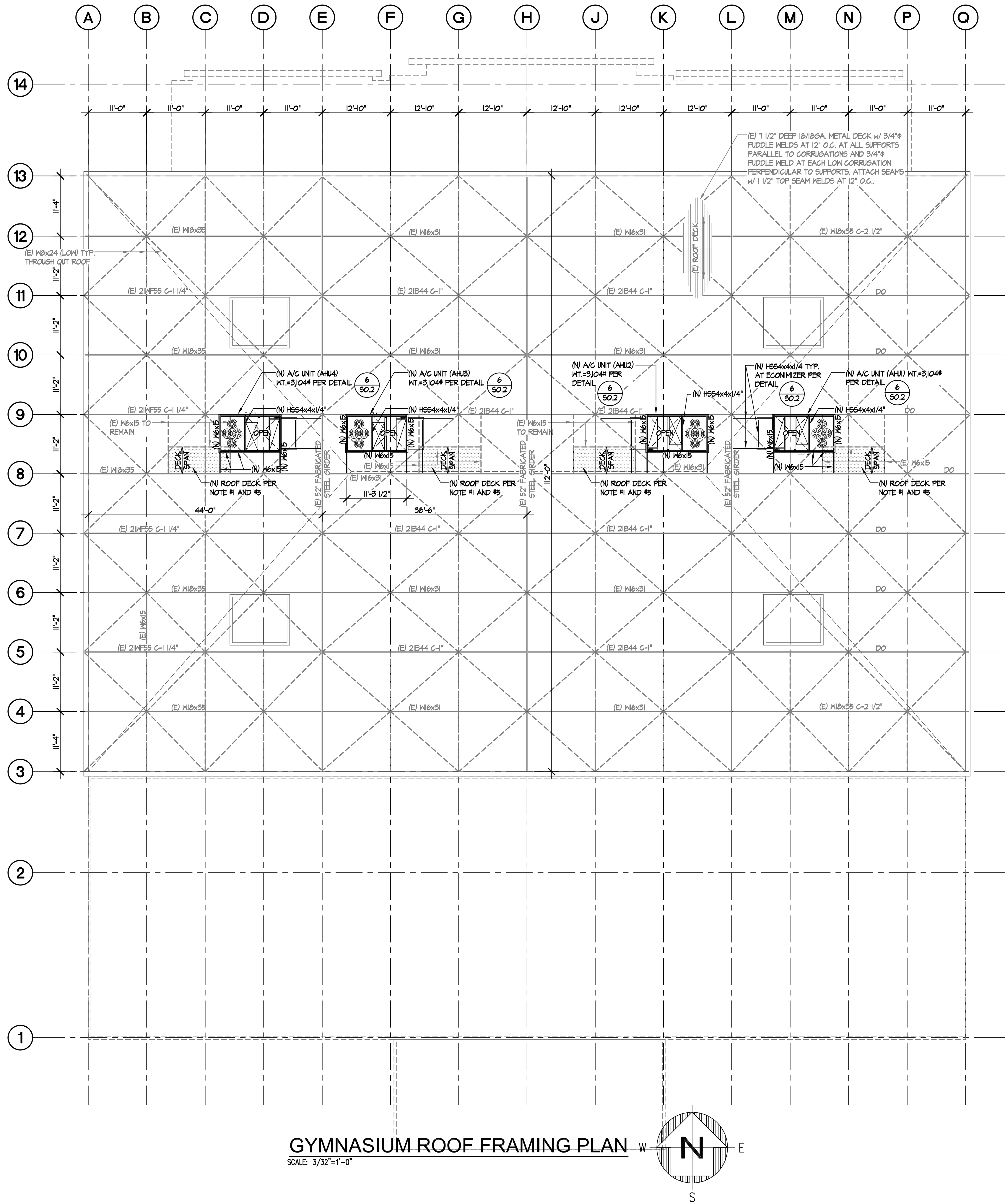
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S0.1



<h1 style="margin: 0;">9</h1>	<h1 style="margin: 0;">Architecture</h1> <h1 style="margin: 0;">PLLLP</h1>
<p>8816 Foothill Boulevard, Suite 103-224 Rancho Cucamonga, CA 91730 a9contact@architecture9.com</p>	
<p>ARCHITECTS STAMP:</p> <div style="text-align: center;">  </div>	
<p>CONSULTANT:</p> <div style="text-align: center;">  </div> <p style="text-align: center;"> ENGINEERING, INC. CONSULTING STRUCTURAL ENGINEERS 4344 LATHAM ST., SUITE 210 RIVERSIDE, CA. 92501-1773 P: 951.684.6200 F: 951.684.6266 JOB NO. 6521-05 </p>	
<p>CONSULTANTS STAMP:</p> <div style="text-align: center;">  </div>	
<p>SCHOOL DISTRICT:</p> <h2 style="margin: 0;">BONITA UNIFIED SCHOOL DISTRICT</h2>	
<p>PROJECT:</p> <h2 style="margin: 0;">SAN DIMAS H.S. GYMNASIUM</h2>	
<p>JOB NUMBER:</p> <p>DATE: 2022-01-14</p>	
<p>REVISION:  DATE: _____</p> <p>REVISION:  DATE: _____</p>	
<p>DRAWING TITLE:</p> <h2 style="margin: 0;">STRUCTURAL DETAILS</h2>	
<p>DRAWING NO.:</p> <h1 style="margin: 0;">S0.2</h1>	

\\bserver\Dropbox (T & B Engineering)\T & B Engineering Inc\Draft and Eng\Jobs\65-21-05-San Dimas Gym hvac Replacement_CAD\S2.1.dwg 9/28/2022 9:21 AM Mark Erlendson



ROOF FRAMING PLAN NOTES

- NEW 3" DEEP 18/18 GA. GALVANIZED VERCO TYPE N-24-CD INSULATED ACOUSTICAL ROOF DECK W/1/2" EFFECTIVE PUDDLE WELD AT 12" O.C. AT ALL SUPPORTS PARALLEL TO CORRUGATIONS AND 1/2" EFFECTIVE PUDDLE WELD AT EACH LOW CORRUGATION PERPENDICULAR TO SUPPORTS. 1 1/2" TOP SEAM WELD AT 12" O.C..
- THE FRAMING IN THE VICINITY OF THE MECHANICAL UNITS WAS DESIGNED FOR THE UNIT SIZE AND WEIGHT AS SHOWN ON THE MECHANICAL DRAWINGS. ANY COSTS INCURRED FROM ANY SUBSTITUTION MADE BY THE CONTRACTOR WHICH REQUIRES RE-DESIGN OR MODIFICATIONS TO THE CONSTRUCTION DOCUMENTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR MAY WISH TO INQUIRE AS TO THE PROBABLE EXTENT OF THESE COSTS PRIOR TO INTRODUCING A SUBSTITUTION.
- NEW Wx BEAM TO EXISTING Wx BEAM CONNECTION PER 2/SO.2. NEW Wx BEAM TO NEW Wx BEAM CONNECTION PER 1/SO.2.
- THE SUPPORT OF THE MECHANICAL UNITS, EXHAUST FANS, CONDENSING UNITS, ETC., AS SHOWN ON THE STRUCTURAL DRAWINGS ARE APPROXIMATE. THE GENERAL CONTRACTOR SHALL COORDINATE THE UNIT TYPE AND QUANTITY WITH THE STRUCTURAL DRAWINGS.
- PROVIDE NEW METAL DECK INFILL PER NOTE #1 AT SHADED AREAS ON ROOF WITH INSULATION TO MATCH EXISTING AT LOCATIONS WHERE EXISTING UNITS ARE BEING REMOVED. NEW METAL DECK INFILL ATTACHMENT PER DETAIL 3/SO.2.

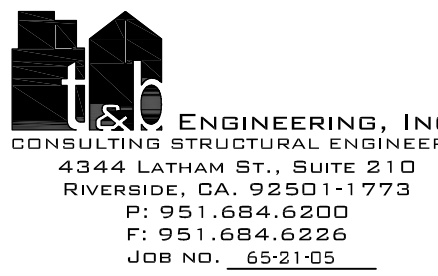
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ARCHITECTS STAMP:



CONSULTANT:



CONSULTANTS STAMP:



SCHOOL DISTRICT:

BONITA UNIFIED
SCHOOL
DISTRICT

PROJECT:

SAN DIMAS H.S.
GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

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



GYMNASIUM
ROOF FRAMING
PLAN

DRAWING NO.:

S2.1

P:\P-2021\2021-191-00 BUSD San Dimas HS-Gym HVAC Upgrade\10_BIM-CAD\MEP\MO.2.dwg 9/19/2022 6:02 PM Charles Cruz

ROOFTOP GAS HEATING/ELECTRIC COOLING PACKAGED AIR-CONDITIONING UNIT SCHEDULE																																				
ITEM NO.	MANUFACTURER MODEL NO.	LOCATION	AREA SERVED	TONS	FAN DATA							COOLING				HEATING				SEER (IEER)	EER	ELECTRICAL DATA				REFRIGERANT			NOISE LEVEL (DBA)	UNIT WEIGHT LBS.	SEISMIC CURB WEIGHT LBS	TOTAL UNIT WEIGHT LBS	DETAIL	REMARKS		
					AIRFLOW CFM	OA CFM	MIN. DCV OA CFM	EXT. S.P. IN.W.G.	DRIVE	QTY	BHP	FAN RPM	TOTAL MBH	SENS. MBH	EAT °F DB WB	LAT °F DB WB	INPUT CAPACITY MBH	OUTPUT CAPACITY MBH	HEATING EAT °F			HEATING LAT °F	EFF. (%)	V-Ø-HZ	FLA	MCA	MOCP	TYPE							CHARGE LBS	CMPSR QTY.
AHU 1	CARRIER 48HCDD24A3A6	ROOFTOP	GYMNASIUM	20.0	7,000	2,325	260	1.40	BELT	2	4.58	1,022	221.5	209.3	82.0 DB 63.3 WB	54.3 DB 52.3 WB	220.0	178.0	57.0	80.5	81.0	(13.8)	12.0	460-3-60	47.6	51.0	60.0	R-410A	35.3	2	87.0	2,529	575	3,104	1 M3.2 3 M3.2 2 M3.3	1 2 3 4 5 6 7 8 9 10 11 12 13
AHU 2	CARRIER 48HCDD24A3A6	ROOFTOP	GYMNASIUM	20.0	7,000	2,325	260	1.40	BELT	2	4.58	1,022	221.5	209.3	82.0 DB 63.3 WB	54.3 DB 52.3 WB	220.0	178.0	57.0	80.5	81.0	(13.8)	12.0	460-3-60	47.6	51.0	60.0	R-410A	35.3	2	87.0	2,529	575	3,104	1 M3.2 3 M3.2 2 M3.3	1 2 3 4 5 6 7 8 9 10 11 12 13
AHU 3	CARRIER 48HCDD24A3A6	ROOFTOP	GYMNASIUM	20.0	7,000	2,325	260	1.40	BELT	2	4.58	1,022	221.5	209.3	82.0 DB 63.3 WB	54.3 DB 52.3 WB	220.0	178.0	57.0	80.5	81.0	(13.8)	12.0	460-3-60	47.6	51.0	60.0	R-410A	35.3	2	87.0	2,529	575	3,104	1 M3.2 3 M3.2 2 M3.3	1 2 3 4 5 6 7 8 9 10 11 12 13
AHU 4	CARRIER 48HCDD24A3A6	ROOFTOP	GYMNASIUM	20.0	7,000	2,325	260	1.40	BELT	2	4.58	1,022	221.5	209.3	82.0 DB 63.3 WB	54.3 DB 52.3 WB	220.0	178.0	57.0	80.5	81.0	(13.8)	12.0	460-3-60	47.6	51.0	60.0	R-410A	35.3	2	87.0	2,529	575	3,104	1 M3.2 3 M3.2 2 M3.3	1 2 3 4 5 6 7 8 9 10 11 12 13
REMARKS:																																				
① VERTICAL DISCHARGE, 2-STAGE COOLING UNIT					④ CONDENSATE DRAIN LINE.					⑦ DISPLAY TYPE 7-DAY PROGRAMMABLE THERMOSTAT.					⑩ INTERLOCK UNIT W/ LOCAL DUCT DETECTORS TO SHUT DOWN UPON ALARM.					⑬ INTERLOCK UNIT W/ EXISTING LOCAL AREA SMOKE DETECTORS TO SHUT DOWN UPON ALARM. REFER TO FIRE ALARM PLANS FOR LOCATIONS.																
② PRE-FAB VIBRATION ISOLATION CURB. +575LBS					⑤ AL/CU COOLING COIL					⑧ OUTSIDE AIR ECONOMIZER HOOD PER DETAIL 2M3.3. EQUIPMENT WEIGHT INCLUDES OUTSIDE AIR INTAKE HOOD.					⑪ MEDIUM STATIC PRESSURE UNIT																					
③ PROVIDE MERV-13 FILTER W/ FILTER DP GAUGE.					⑥ DISCONNECT. SEE ELECTRICAL.					⑨ INTERLOCK WITH CO2 SENSOR FOR DEMAND CONTROL VENTILATION.					⑫ VFD CONTROLLER																					

EXHAUST FAN SCHEDULE																	
ITEM NO.	MANUFACTURER MODEL NO.	SERVICE AREA	LOCATION	FAN TYPE	DRIVE	AIR FLOW CFM	E.S.P. IN. H2O	EST. FAN RPM	MAX FAN RPM	MOTOR				NOISE LEVEL dBA (SONES)	EST. OPERATING WEIGHT LBS.	DETAIL	REMARKS
										RPM	FLA	HP	V-Ø-HZ				
(E) EF-1	LOREN COOK ACE-B 490C8B	GYMNASIUM	ROOFTOP	CENTRIFUGAL	BELT	6,800	0.125	221	221	1,725	3	1.5	460-3-60	50 (5.3)	469		1 2 3
(E) EF-2	LOREN COOK ACE-B 490C8B	GYMNASIUM	ROOFTOP	CENTRIFUGAL	BELT	6,800	0.125	221	221	1,725	3	1.5	460-3-60	50 (5.3)	469		1 2 3
(E) EF-3	LOREN COOK ACE-B 490C8B	GYMNASIUM	ROOFTOP	CENTRIFUGAL	BELT	6,800	0.125	221	221	1,725	3	1.5	460-3-60	50 (5.3)	469		1 2 3
(E) EF-4	LOREN COOK ACE-B 490C8B	GYMNASIUM	ROOFTOP	CENTRIFUGAL	BELT	6,800	0.125	221	221	1,725	3	1.5	460-3-60	50 (5.3)	469		1 2 3
REMARKS:																	
① EXISTING EXHAUST FAN'S INTERNAL COMPONENTS TO BE REPLACED WITH NEW FAN WHEEL, BELT, SHEAVE, SHAFT, BEARING, ETC. TO MEET SCHEDULED PERFORMANCE. OVERALL REDUCTION IN UNIT WEIGHT. REFER TO DETAIL FOR BEFORE AND AFTER SUBMITTALS, AND REFER TO M-1 MECHANICAL EQUIPMENT SCHEDULE FROM ORIGINAL AS-BUILTS FOR EQUIPMENT WEIGHT FROM BASIS OF DESIGN (837 LBS). PROVIDE WITH NEW EQUIPMENT NAMEPLATE FOR UPDATED PERFORMANCE.										② INTERLOCK EXHAUST FAN WITH BAS TO MAINTAIN BUILDING PRESSURIZATION. REFER TO CONTROL DIAGRAMS FOR DETAILS.				③ REESTABLISH EXHAUST FAN POWER CONNECTION VIA SCHEDULED VFD. REFER TO WIRING DIAGRAM 9M3.2.			

VARIABLE FREQUENCY DRIVE SCHEDULE												
ITEM NO.	MANUFACTURER & MODEL NO.	LOCATION	SYSTEM SERVED	TYPE	VFD		VOLT	PHASE	HERTZ	WEIGHT	DETAIL	REMARKS
					HP	FLA						
<div>VFD</div> <div>1</div>	YASKAWA HV600	GROUND	EF-1	UL NEMA 3R	2	3.4	480	3	60	33	<div>3</div> <div>M3.2</div>	<div>1</div> <div>2</div> <div>3</div>
<div>VFD</div> <div>2</div>	YASKAWA HV600	GROUND	EF-2	UL NEMA 3R	2	3.4	480	3	60	33	<div>3</div> <div>M3.2</div>	<div>1</div> <div>2</div> <div>3</div>
<div>VFD</div> <div>3</div>	YASKAWA HV600	GROUND	EF-3	UL NEMA 3R	2	3.4	480	3	60	33	<div>3</div> <div>M3.2</div>	<div>1</div> <div>2</div> <div>3</div>
<div>VFD</div> <div>4</div>	YASKAWA HV600	GROUND	EF-4	UL NEMA 3R	2	3.4	480	3	60	33	<div>3</div> <div>M3.2</div>	<div>1</div> <div>2</div> <div>3</div>
<div>REMARKS:</div> <div><div>①</div> PROVIDE AC LINE REACTORS, SERVICE SWITH AND ECLIPSE BYPASS. PROVIDE BACNET AND CIRCUIT BREAKER.</div> <div><div>②</div> MOTOR TIED TO VFD SHALL BE PROVIDED WITH SHAFT GROUNDING DEVICE.</div> <div><div>③</div> NEMA TYPE 12 VFD INSIDE A NEMA 1 ENCLOSURE COMPLETELY ASSEMBLED AND TESTED BY MANUFACTURER IN AN ISO9001 FACILITY.</div>												

2019 CALIFORNIA GREEN BUILDING STANDARDS CODE

- UNLESS SPECIFIED OTHERWISE, FOR ALL NEW MECHANICAL SYSTEMS, PROVIDE AIR FILTRATION MEDIA FOR OA AND RA PRIOR TO OCCUPANCY THAT PROVIDES MIN. MERV-13 FILTER.
- 2019 GBC 5.410.4.3 PROCEDURES - PERFORM TESTING AND ADJUSTING PROCEDURES IN ACCORDANCE W/ MANU'F SPECIFICATIONS AND APPLICABLE STANDARDS ON EACH SYSTEM.
- 2019 GBC 5.410.4.4 REPORTING - AFTER COMPLETION OF TESTING, ADJUSTING AND BALANCING, PROVIDE A FINAL REPORT OF TESTING SIGNED BY THE INDIVIDUAL RESPONSIBLE FOR PERFORMING THESE SERVICES.
- 2019 GBC 5.410.4.3.1 HVAC BALANCING - IN ADDITION TO TESTING AND ADJUSTING,BEFORE A NEW SPACE-CONDITIONING SYSTEM SERVING A BUILDING OR SPACE IS OPERATED FOR NORMAL USE, BALANCE THE SYSTEM IN ACCORDANCE WITH THE PROCEDURES DEFINED BY THE TESTING ADJUSTING AND BALANCING BUREAU NATIONAL STANDARDS;THE NATIONAL ENVIRONMENTAL BALANCING BUREAU PROCEDURAL STANDARDS;ASSOCIATED AIR BALANCE COUNCIL NATIONAL STANDARDS OF AS APPROVED BY THE ENFORCING AGENCY.
- 2019 GBC 5.410.4.5.1 INSPECTIONS AND REPORTS - INCLUDE A COPY OF ALL INSPECTION VERIFICATION AND REPORTS REQUIRED BY THE ENFORCING AGENCY.
- 2019 GBC 5.410.4.2 SYSTEMS - DEVELOP A WRITTEN PLAN OF PROCEDURES FOR TESTING AND ADJUSTING SYSTEMS. SYSTEMS TO BE INCLUDED FOR TESTING AND ADJUSTING SHALL INCLUDE, AS APPLICABLE TO THE PROJECT.
 - HVAC SYSTEMS AND CONTROLS
 - INDOOR AND OUTDOOR LIGHTING AND CONTROLS
 - WATER HEATING SYSTEMS
 - RENEWABLE ENERGY SYSTEMS
 - LANDSCAPE IRRIGATION SYSTEMS
 - WATER REUSE SYSTEMS
- 2019 GBC 5.410.4.5 OPERATION AND MAINTENANCE (O & M) MANUAL - PROVIDE THE BUILDING OWNER OR REPRESENTATIVE WITH DETAILED OPERATING AND MAINTENANCE INSTRUCTIONS AND COPIES OF GUARANTIES/ WARRANTIES FOR EACH SYSTEM. O & M INSTRUCTIONS SHALL BE CONSISTENT WITH OSHA REQUIREMENTS IN CCR, TITLE 8, SECTION 5142, AND OTHER RELATED REGULATIONS.
- 2019 GBC 5.505.1 INDOOR MOISTURE CONTROL - BUILDINGS SHALL MEET OR EXCEED THE PROVISIONS OF CALIFORNIA BUILDING CODE, CCR, TITLE 24, PART 2, SECTIONS 1203 AND CHAPTER 14.1.

- 2019 GBC 5.410.4 TESTING AND ADJUSTING- TESTING AND ADJUSTING OF SYSTEMS SHALL BE REQUIRED FOR NEW BUILDINGS LESS THAN 10,000 SQ. FT. OR NEW SYSTEMS SERVING AN ADDITION OR ALTERATION SUBJECT TO SECTION 303.1. SEE PROJECT SPECIFICATION SECTION 23 05 93 "TESTING, ADJUSTING AND BALANCING FOR HVAC" AND SECTION 23 08 00 "COMMISSIONING OF HVAC" FOR DETAILED REQUIREMENTS RELATING TO TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS, AS WELL AS RELATED TEST AND BALANCE PROCEDURES, REPORTING, EQUIPMENT OPERATION AND MAINTENANCE MANUALS, INSPECTIONS AND REPORTS."
- 2019 GBC 5.506.2 CARBON DIOXIDE(CO2)MONITORING - PROVIDE CO2 SENSORS FOR DEMAND CONTROL VENTILATION. SEE PROJECT SPECIFICATION SECTION 23 05 93 "TESTING, ADJUSTING AND BALANCING FOR HVAC" AS WELL AS CONTROLS AND WIRING DIAGRAMS ON PLANS FOR DETAILED REQUIREMENTS RELATED TO CARBON DIOXIDE (CO2) MONITORING AND DEMAND CONTROL VENTILATION AND INSTALLED WITH THE REQUIREMENTS OF THE CALIFORNIA ENERGY CODE, CCR, SECTION 121(C).
 - 2019 GBC A5.504.1 INDOOR AIR QUALITY (IAQ) DURING CONSTRUCTION - MAINTAIN IAQ AS PROVIDED IN SECTION A5.504.1.1 AND 5.504.1.2.
 - A5.504.1.1 TEMPORARY VENTILATION - PROVIDE TEMPORARY VENTILATION DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 121 OF THE CALIFORNIA ENERGY CODE, CCR, TITLE 24, PART 6 AND CHAPTER 4 OF CCR, TITLE 8 AND AS LISTED IN ITEMS 1 AND SECTION 2 A5.504.1.2.
 - A5.504.1.2 EMPLOY ADDITIONAL MEASURES AS LISTED IN ITEMS 1 THROUGH 5 IN SECTION A5.504.1.3.
 - 5.504.1.3 TEMPORARY VENTILATION - IF THE HVAC SYSTEM IS USED DURING CONSTRUCTION, USE RETURN AIR FILTERS WITH MERV OF 8, BASED ON ASHRAE 52.2-1999, OR AN AVERAGE EFFICIENCY OF 30% BASED ON ASHRAE 52.1-1992. REPLACE ALL FILTERS IMMEDIATELY PRIOR TO OCCUPANCY. APPLIES TO ADDITIONS OR ALTERATIONS.
 - 2019 GBC A5.504.2 INDOOR AIR QUALITY (IAQ) POST CONSTRUCTION: FLUSH OUT THE BUILDING PER SECTION A5.504.2 PRIOR TO OCCUPANCY OR IF THE BUILDING IS OCCUPIED.
 - A5.504.2.1 - IAQ TESTING: A TESTING ALTERNATIVE MAY BE EMPLOYED AFTER ALL INTERIOR FINISHES HAVE BEEN INSTALLED, USING TESTING PROTOCOLS RECOGNIZED BY THE UNITED STATE ENVIRONMENTAL PROTECTION AGENCY (U.S. EPA) AND IN ACCORDANCE WITH SECTION A5.504.2.1.2. RETEST AS REQUIRED IN SECTION A5.504.2.1.3.
 - A5.504.2.1.1 - MAXIMUM LEVELS OF CONTAMINATION: ALLOWABLE LEVELS OF CONTAMINANT CONCENTRATIONS MEASURED BY TESTING SHALL NOT EXCEED THE FOLLOWING:
 - CARBON MONOXIDE (CO): 9 PARTS PER MILLION, NOT TO EXCEED OUTDOOR LEVELS BY 2 PPM.
 - FORMALDEHYDE: 27 PARTS PER BILLION.
 - PARTICULATES (PM10): 50 MICROGRAMS PER CUBIC METER.
 - 4-PHENYLCYCLOHEXENE (4-PCH): 6.5 MICROGRAMS PER CUBIC METER, AND
 - TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC): 300 MICROGRAMS PER CUBIC METER.
 - A5.504.2.1.2 TEST PROTOCOLS: TESTING OF IAQ SHOULD INCLUDE THE ELEMENTS LISTED IN ITEMS 1 THROUGH 4.
 - 2019 GBC 5.504.3 COVERING OF DUCT OPENINGS AND PROTECTION OF MECHANICAL EQPT. DURING CONSTRUCTION - AT THE TIME OF ROUGH INSTALLATION AND DURING STARTUP ON THE CONSTRUCTION SITE UNTIL FINAL STARTUP OF THE HEATING, COOLING AND VENTILATING EQUIPMENT, ALL DUCT AND OTHER RELATED COMPONENT OPENINGS SHALL BE COVERED WITH TAPE, PLASTIC, SHEET METAL OR OTHER METHODS ACCEPTABLE TO THE DEPARTMENT TO REDUCE THE AMOUNT OF DUST, WATER AND DEBRIS WHICH MAY ENTER THE SYSTEM.

GENERAL PLAN NOTES

OWNER'S RESPONSIBILITIES

- PROVIDE THE OWNER'S PROJECT REQUIREMENT (OPR) DOCUMENTATION TO THE COMMISSIONING AGENT (CXA) AND CONTRACTOR FOR INFORMATION AND USE.

- ASSIGN OPERATION AND MAINTENANCE PERSONNEL AND SCHEDULE THEM TO PARTICIPATE IN COMMISSIONING TEAM ACTIVITIES.

- PROVIDE THE BOD DOCUMENTATION, PREPARED BY ARCHITECT AND APPROVED BY CLIENT, TO THE CXA AND CONTRACTOR FOR USE IN DEVELOPING THE COMMISSIONING PLAN, SYSTEMS MANUAL, AND OAM TRAINING PLAN.

CONTRACTOR'S RESPONSIBILITIES

- EVALUATE PERFORMANCE DEFICIENCIES IDENTIFIED IN TEST REPORTS AND, IN COLLABORATION WITH ENTITY RESPONSIBLE FOR SYSTEM AND EQUIPMENT INSTALLATION, RECOMMEND CORRECTIVE ACTION.

- COOPERATE W/ CXA FOR RESOLUTION OF ISSUES RECORDED IN THE ISSUES LOG.

- ATTEND COMMISSIONING TEAM MEETINGS HELD ON A VARIABLE BASIS.

- INTEGRATE AND COORDINATE COMMISSIONING PROCESS ACTIVITIES W/ CONSTRUCTION SCHEDULE.

- REVIEW AND ACCEPT CONSTRUCTION CHECKLISTS PROVIDED BY THE CXA.

- COMPLETE ELECTRONIC CONSTRUCTION CHECKLISTS AS WORK IS COMPLETED AND PROVIDE TO THE COMMISSIONING AUTHORITY.

- REVIEW AND ACCEPT COMMISSIONING PROCESS TEST PROCEDURES PROVIDED BY THE COMMISSIONING AUTHORITY.

- COMPLETE COMMISSIONING PROCESS TEST PROCEDURES.

COMMISSIONING TEAM

- MEMBERS APPOINTED BY CONTRACTOR(S): INDIVIDUALS, EACH HAVING THE AUTHORITY TO ACT ON BEHALF OF THE ENTITY HE OR SHE REPRESENTS, EXPLICITLY ORGANIZED TO IMPLEMENT THE COMMISSIONING PROCESS THROUGH COORDINATED ACTION. THE COMMISSIONING TEAM SHALL CONSIST OF, BUT NOT BE LIMITED TO, REPRESENTATIVES OF CONTRACTOR, INCLUDING PROJECT SUPERINTENDENT AND SUBCONTRACTORS, INSTALLERS, SUPPLIERS, AND SPECIALISTS DEEMED APPROPRIATE BY THE CXA.

- MEMBERS APPOINTED BY OWNER:

- CXA: THE DESIGNATED PERSON, COMPANY, OR ENTITY THAT PLANS, SCHEDULES, AND COORDINATES THE COMMISSIONING TEAM TO IMPLEMENT THE COMMISSIONING PROCESS. OWNER WILL ENGAGE THE CXA UNDER A SEPARATE CONTRACT.

- REPRESENTATIVES OF THE FACILITY USER AND OPERATION AND MAINTENANCE PERSONNEL.

- ARCHITECT AND ENGINEERING DESIGN PROFESSIONALS.

CXA'S RESPONSIBILITIES

- ORGANIZE AND LEAD THE COMMISSIONING TEAM.

- PROVIDE COMMISSIONING PLAN.

- CONVENE COMMISSIONING TEAM MEETINGS.

- PROVIDE PROJECT-SPECIFIC CONSTRUCTION CHECKLISTS AND COMMISSIONING PROCESS TEST PROCEDURES.

- VERIFY THE EXECUTION OF COMMISSIONING PROCESS ACTIVITIES USING RANDOM SAMPLING. THE SAMPLING RATE MAY VARY FROM 1 TO 100 PERCENT. VERIFICATION WILL INCLUDE, BUT IS NOT LIMITED TO, EQUIPMENT SUBMITTALS, CONSTRUCTION CHECKLISTS, TRAINING, OPERATING AND MAINTENANCE DATA, TESTS, AND TEST REPORTS TO VERIFY COMPLIANCE WITH THE OPR. WHEN A RANDOM SAMPLE DOES NOT MEET THE REQUIREMENT, THE CXA WILL REPORT THE FAILURE IN THE ISSUES LOG.

- PREPARE AND MAINTAIN THE ISSUES LOG.

- PREPARE AND MAINTAIN COMPLETED CONSTRUCTION CHECKLIST LOG.

- WITNESS SYSTEMS, ASSEMBLIES, EQUIPMENT, AND COMPONENT STARTUP.

- COMPILE TEST DATA, INSPECTION REPORTS, AND CERTIFICATES; INCLUDE THEM IN THE SYSTEMS MANUAL AND COMMISSIONING PROCESS REPORT.

Architecture
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CONSULTANTS STAMP:



SCHOOL DISTRICT:

SAN DIMAS
SCHOOL
DISTRICT

PROJECT:

SAN DIMAS HS
GYM

JOB NUMBER: 12.03.01

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

MECHANICAL
SCHEDULES

DRAWING NO.:

M0.2

P:\P-2021\2021-191-00 BUSD San Dimas HS-Gym HVAC Upgrade\10_BIM-CAD\MEP\W0.3.dwg 9/19/2022 6:02 PM Charles Cruz

Project Name:	San Dimas HS Gym	NRCC-PRF-01-E	Page 1 of 9
Project Address:	800 W Covina Blvd San Dimas 91773	Calculation Date/Time:	19:03, Thu, Feb 17, 2022
Input File Name:	2020-020-00 San Dimas HS Gym.cibd19x		

A. GENERAL INFORMATION

1	Project Location (city)	San Dimas	8	Standards Version	Compliance2019
2	CA Zip Code	91773	9	Compliance Software (version)	EnergyPro 8.2
3	Climate Zone	9	10	Weather File	LOS-ANGELES-DOWNTOWN\722874_CZ2010.aspw
4	Total Conditioned Floor Area in Scope	17,777 ft²	11	Building Orientation (deg)	(N) 0 deg
5	Total Unconditioned Floor Area	147 ft²	12	Permitted Scope of Work	ExistingAlteration
6	Total # of Stories (Habitable Above Grade)	1	13	Building Type(s)	Nonresidential
7	Total # of dwelling units	0	14	Gas Type	NaturalGas

B. PROJECT SUMMARY

Table Instructions: Table B shows which building components are included in the performance calculation. If indicated as not included, the project must show compliance prescriptively if within permit applications.

Building Components Complying via Performance				Building Components Complying Prescriptively			
Envelope (see Table G)	<input type="checkbox"/> Performance	Covered Process: Commercial Kitchens	<input type="checkbox"/> Performance	The following building components are ONLY eligible for prescriptive compliance and should be documented on the NRCC form listed if within the scope of the permit application (i.e. compliance will not be shown on the NRCC-PRF-E).			
	<input checked="" type="checkbox"/> Not Included		<input checked="" type="checkbox"/> Not Included				
Mechanical (see Table H)	<input checked="" type="checkbox"/> Performance	Covered Process: Computer Rooms	<input type="checkbox"/> Performance	Indoor Lighting (Unconditioned)\$140.6	NRCC-LTI-E		
	<input type="checkbox"/> Not Included		<input checked="" type="checkbox"/> Not Included	Outdoor Lighting \$140.7	NRCC-LTO-E		
Domestic Hot Water (see Table I)	<input checked="" type="checkbox"/> Performance	Covered Process: Laboratory Exhaust	<input type="checkbox"/> Performance	Sign Lighting \$140.8	NRCC-LTS-E		
	<input type="checkbox"/> Not Included		<input checked="" type="checkbox"/> Not Included	Mandatory Measures			
Lighting (Indoor Conditioned, see Table K)	<input type="checkbox"/> Performance			Electrical power systems, commissioning, solar ready, elevator and escalator requirements are mandatory and should on the NRCC form listed if applicable (i.e. compliance will not be shown on the NRCC-PRF-E).			
	<input checked="" type="checkbox"/> Not Included			Electrical Power Distribution \$110.11 NRCC-ELC-E			
Solar Thermal Water Heating (see Table I)	<input type="checkbox"/> Performance			Commissioning \$120.8 NRCC-CKR-E			
	<input checked="" type="checkbox"/> Not Included			Solar Ready \$110.10 NRCC-SRA-E			

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance

Report Version: NRCC-PRF-01-E-12202021-6384

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Project Name:	San Dimas HS Gym	NRCC-PRF-01-E	Page 2 of 9
Project Address:	800 W Covina Blvd San Dimas 91773	Calculation Date/Time:	19:03, Thu, Feb 17, 2022
Input File Name:	2020-020-00 San Dimas HS Gym.cibd19x		

C1. COMPLIANCE RESULTS FOR PERFORMANCE COMPONENTS (Annual TDV Energy Use, kBtu/ft²-yr)

COMPLIES			
Energy Component	Standard Design (TDV)	Proposed Design (TDV)	Compliance Margin (TDV)¹
Space Heating	29.46	1.61	27.85
Space Cooling	91.62	92.58	-0.96
Indoor Fans	66.51	77.09	-10.58
Heat Rejection	--	--	--
Pumps & Misc.	--	--	--
Domestic Hot Water	8.24	8.24	--
Indoor Lighting	52.61	52.61	--
ENERGY STANDARDS COMPLIANCE TOTAL	248.44	232.13	16.31 (6.6%)

¹ Notes: The number in parenthesis following the Compliance Margin in column 4, represents the Percent Better than Standard.

C2. RESULTS FOR 'ABOVE CODE' QUALIFICATIONS¹

<input type="checkbox"/> This project is pursuing CalGreen Tier 1				<input type="checkbox"/> This project is pursuing CalGreen Tier 2			
Miscellaneous Energy Component	Standard Design (TDV)	Proposed Design (TDV)	Compliance Margin (TDV)¹				
Receptacle	59.16	59.16	--				
Process	69.10	69.10	--				
Other Ltg	0.34	0.34	--				
Process Motors	--	--	--				
COMPLIANCE TOTAL PLUS MISCELLANEOUS COMPONENTS	377.04	360.73	16.3 (4.3%)				

¹ Notes: This table is used to document compliance with programs OTHER THAN Title 24 Part 6, if applicable.

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance

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C3. ENERGY USE SUMMARY

Energy Component	Standard Design Site (MWh)	Proposed Design Site (MWh)	Margin (MWh)	Standard Design Site (MBtu)	Proposed Design Site (MBtu)	Margin (MBtu)
Space Heating	--	--	--	259.8	16.0	243.8
Space Cooling	33.7	37.3	-3.6	--	--	--
Indoor Fans	39.6	41.6	-2.0	--	--	--
Heat Rejection	--	--	--	--	--	--
Pumps & Misc.	--	--	--	--	--	--
Domestic Hot Water	--	--	--	81.0	81.0	0.0
Indoor Lighting	31.1	31.1	0.0	--	--	--
Compliance Total	104.4	110.0	-5.6	340.8	97.0	243.8
Receptacle	34.9	34.9	0.0	--	--	--
Process	40.8	40.8	0.0	--	--	--
Other Ltg	0.2	0.2	0.0	--	--	--
Process Motors	--	--	--	--	--	--
TOTAL	180.3	185.9	-5.6	340.8	97.0	243.8

D. EXCEPTIONAL CONDITIONS

E. HERS VERIFICATION

This Section Does Not Apply

H1. DRY SYSTEM EQUIPMENT (fumaces, air handling units, heat pumps, VRF, economizers etc.)

1	2	3	4	5	6	7	8	9	10	11	12
Equipment Name	Equipment Type	Qty	Heating				Cooling			Economizer Type (if present)	Status
			Total Heating Output (kBtu/h)	Supp Heat Output (kBtu/h)	Efficiency Unit	Efficiency	Total Cooling Output (kBtu/h)	Efficiency Unit	Efficiency		
[AHU-1 2 3 4]	SZVAVAC (Packaged3Phase)	4	178	0	AFUE	81.0	222	EER	12.0	FixedDryBulb	N

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance

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Input File Name:	2020-020-00 San Dimas HS Gym.cibd19x		

H1. DRY SYSTEM EQUIPMENT (fumaces, air handling units, heat pumps, VRF, economizers etc.)

1	2	3	4	5	6	7	8	9	10	11	12
Equipment Name	Equipment Type	Qty	Heating				Cooling			Economiser Type (if present)	Status ⁵
			Total Heating Output (kBtu/h)	Supp Heat Output (kBtu/h)	Efficiency Unit	Efficiency	Total Cooling Output (kBtu/h)	Efficiency Unit	Efficiency		
			Status: N - New, A - Altered, E - Existing								

H2. FAN SYSTEMS SUMMARY²

1	2	3	4	5	6	7	8	9	10	11	12	13
Name or Item Tag	System Type	Design OA	Supply Fan				Return Fan				Economizer Type (if present)	Status¹
	packaged, DOAS, etc.	CFM	CFM	BHP	Watts	Control	CFM	BHP	Watts	Control		
[AHU-1 2 3 4]	SZVAVAC	2176	7000	4.580	3815.5	VariableSpeedDrive	NA	NA	NA	NA	FixedDryBulb	N

² Status: N - New, A - Altered, F - Existing

H3. EXHAUST FAN SUMMARY

1	2	3	4	5	6	7
System ID	Zone Name	Qty	CFM	Motor BHP	Motor Watts	Total Static Pressure (in H2O)
Gymnasium A-263	1-Gymnasium A-26	4	6,800	2,000	1666.1	1.21

H4. Wet System Equipment (boilers, chillers, cooling towers, etc.)

1	2	3	4	5	6	7	8	9	10	11	12
Name or Item Tag	Equipment Type	Qty	Vol (gal)	Rated Capacity (kBtu/h)	Efficiency	Standby Loss	Pumps				Status ¹
							Qty	GPM	HP	VSD (Y/N)	
							Status: N - New, A - Altered, E - Existing				

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance

Report Version: NRCC-PRF-01-E-12202021-6384

Report Generated at: 2022-02-17 19:05:41

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SCHOOL DISTRICT:

SAN DIMAS
SCHOOL
DISTRICT

PROJECT:

SAN DIMAS HS
GYM

JOB NUMBER: 12.03.01

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

T24 COMPLIANCE
FORMS

DRAWING NO.:

M0.3

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Project Name:	San Dimas HS Gym	NRCC-PRF-01-E	Page 5 of 9
Project Address:	800 W Covina Blvd San Dimas 91773	Calculation Date/Time:	19:03, Thu, Feb 17, 2022
Input File Name:	2020-020-00 San Dimas HS Gym.cibd19x		

H5. SYSTEM SPECIAL FEATURES					
1	2	3	4	5	6
System Name	Optimum Start	Window Interlocks per §140.4(n)	Evaporative Cooling	Heat Recovery	Other Controls
[AHU-1 2 3 4]	Optimum Start	NA	No Evaporative Cooler	No Heat Recovery	No DCV Controls, DDC Controls Fixed Drybulb Economizer No Supply Air Temp. Control
Existing Plant1 - SHW	NA	NA	NA	NA	Fixed Temperature Control, No DDC

Notes: This table includes controls related to the performance path only. For projects using the prescriptive path, mandatory and prescriptive controls requirements are documented on the NRCC-MCH-E.

H6. MECHANICAL VENTILATION								
1	2	3	4	5	6	7	8	9
Zone Name	Mechanical Ventilation							DCV or Occupant Sensor Controls, or Both
	Ventilation Function	# hotel rooms	# of people	# of bedrooms	Supply OA CFM	Exhaust CFM	Conditioned Area (sf)	
1-Gymnasium A-26	Sports/Entertainment - Gym, sports arena (play area) Misc - All others	0	220.23	0	8702	27200	17777	NA

Multifamily or Hotel/Motel Occupancy? (If "Yes", see DOMESTIC/SERVICE HOT WATER SYSTEM SUMMARY)	No
--	----

Does the Project include Zonal Systems?	No
---	----

H7. ZONAL SYSTEM AND TERMINAL UNIT SUMMARY											
1	2	3	4	5	6	7	8	9	10	11	12
System ID	Zone Name	System Type	Rated Capacity (kBtu/h)		Airflow (cfm)			Fan			
			Heating	Cooling	Design	Min.	Min. Ratio	BHP	Watts	Cycles	ECM Motor
1-Gymnasium A-26-Trm	1-Gymnasium A-26	VAVNoReheatBox	NA	NA	28000	0	0.00	NA	NA	NA	<input type="checkbox"/>

H8. EVAPORATIVE COOLER SUMMARY											
This Section Does Not Apply											

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Project Address:	800 W Covina Blvd San Dimas 91773	Calculation Date/Time:	19:03, Thu, Feb 17, 2022
Input File Name:	2020-020-00 San Dimas HS Gym.cibc19x		

I1. WATER HEATER EQUIPMENT SUMMARY													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Name	Heater Element Type	Tank Type	Qty	Tank Vol (gal)	Rated Input	Rated Input Unit	Efficiency	Efficiency Unit	Tank Insulation R-value (Int/Ext)	Standby Loss Fraction	Heat Pump Type	1st Hour Rating or Flow Rate (gal)	Tank Location or Ambient Condition
Default Gas 2000 - 20142	Gas	Storage	1	50.00	40	kBtu/h	0.57	EF	NA	NA	NA	NA	NA

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Project Name:	San Dimas HS Gym	NRCC-PRF-01-E	Page 7 of 9
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Input File Name:	2020-020-00 San Dimas HS Gym.cibd19x		

L. DECLARATION OF REQUIRED CERTIFICATES OF INSTALLATION											
Table Instructions: Selections shall be made by Documentation Author to indicate which Certificates of Installation must be submitted for the features to be recognized for compliance. These documents must be retained and provided to the building inspector during construction and can be found online at: https://www.energy.ca.gov/title24/2019standards/2019_compliance_documents/Nonresidential_Documents/NRCI/											
Building Component	Form/Title										
Mechanical	NRCI-MCH-01-E - Must be submitted for all buildings										
Plumbing	NRCI-PLB-01-E - Must be submitted for all buildings										

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance Report Version: NRCC-PRF-01-E-12202021-6384 Report Generated at: 2022-02-17 19:05:41

Project Name:	San Dimas HS Gym	NRCC-PRF-01-E	Page 8 of 9
Project Address:	800 W Covina Blvd San Dimas 91773	Calculation Date/Time:	19:03, Thu, Feb 17, 2022
Input File Name:	2020-020-00 San Dimas HS Gym.cibd19x		

M. DECLARATION OF REQUIRED CERTIFICATES OF ACCEPTANCE											
Table Instructions: Selections shall be made by Documentation Author to indicate which Certificates of Acceptance must be submitted for the features to be recognized for compliance. These documents must be provided to the building inspector during construction and must be completed through an Acceptance Test Technician Certification Provider (ATTCP). For more information visit: https://www.energy.ca.gov/title24/2019standards/2019_compliance_documents/Nonresidential_Documents/NRCA/											
Building Component	Form/Title										
Mechanical	NRCA-MCH-02-A Outdoor Air must be submitted for all newly installed HVAC units. Note: MCH02-A can be performed in conjunction with MCH-07-A Supply Fan VFD Acceptance (if applicable) since testing activities overlap.										
	NRCA-MCH-05-A Air Economizer Controls										
	NRCA-MCH-07-A Supply Fan Variable Flow Controls										
	NRCA-MCH-12-A FDD for Packaged Direct Expansion Units										

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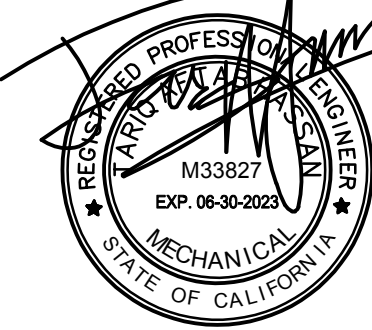


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CONSULTANTS STAMP:



SCHOOL DISTRICT:

SAN DIMAS
SCHOOL
DISTRICT

PROJECT:

SAN DIMAS HS
GYM

JOB NUMBER: 12.03.01
DATE: 2022-01-14

REVISION: DATE: _____
REVISION: DATE: _____

DRAWING TITLE:

T24 COMPLIANCE
FORMS

DRAWING NO.:

M0.4

Project Name:	San Dimas HS Gym	NRCC-PHF-01-E	Page 9 of 9
Project Address:	800 W Covina Blvd San Dimas 91773	Calculation Date/Time:	15:17, Thu, Feb 24, 2022
Input File Name:	2020-020-00 San Dimas HS Gym_1.ctb		

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: Noe Portilla	Signature: <i>Noe Portilla</i>
Company: PBS Engineers	
Address: 2100 East Route 66, Suite 210	Signature Date: 2022-02-24
City/State/Zip: Glendora CA 91740	CEA/ HERS Certification Identification (if applicable):
Phone: 626-650-0350	

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.

2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).

3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.

4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.

5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Envelope Designer Name:	Signature:	
Company: Architecture 9 PLLP		
Address: 8116 Foothill Boulevard, Suite 103-224	Date Signed:	
City/State/Zip: Rancho Cucamonga CA 91730		
Phone: (909)204-9733	Title:	License #:
Responsible Lighting Designer Name:	Signature: NOT IN SCOPE	
Company:		
Address:	Date Signed:	
City/State/Zip:		
Phone:	Title:	License #:
Responsible Mechanical Designer Name: Noe Portilla	Signature: <i>Noe Portilla</i>	
Company: PBS Engineers		
Address: 2100 E Route 66 Suite 210	Date Signed: 2022-02-24	
City/State/Zip: Glendora California 91740		
Phone: 626-650-0350	Title:	License #: M29029

CA Building Energy Efficiency Standards: 2019 Nonresidential Compliance

Report Version: NRCC-PHF-01-E-12202021-6384

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LICENSED ARCHITECT

STEVEN M. GELSINGER

C-28546

5/31/28

RENEWAL DATE

STATE OF CALIFORNIA

CONSULTANT:

PBS

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REGISTERED PROFESSIONAL ENGINEER

M33827

EXP. 06-30-2023

MECHANICAL

STATE OF CALIFORNIA

SCHOOL DISTRICT:

SAN DIMAS
SCHOOL
DISTRICT

PROJECT:

SAN DIMAS HS
GYM

JOB NUMBER: 12.03.01
DATE: 2022-01-14

REVISION:

1

 DATE: _____
REVISION:

2

 DATE: _____

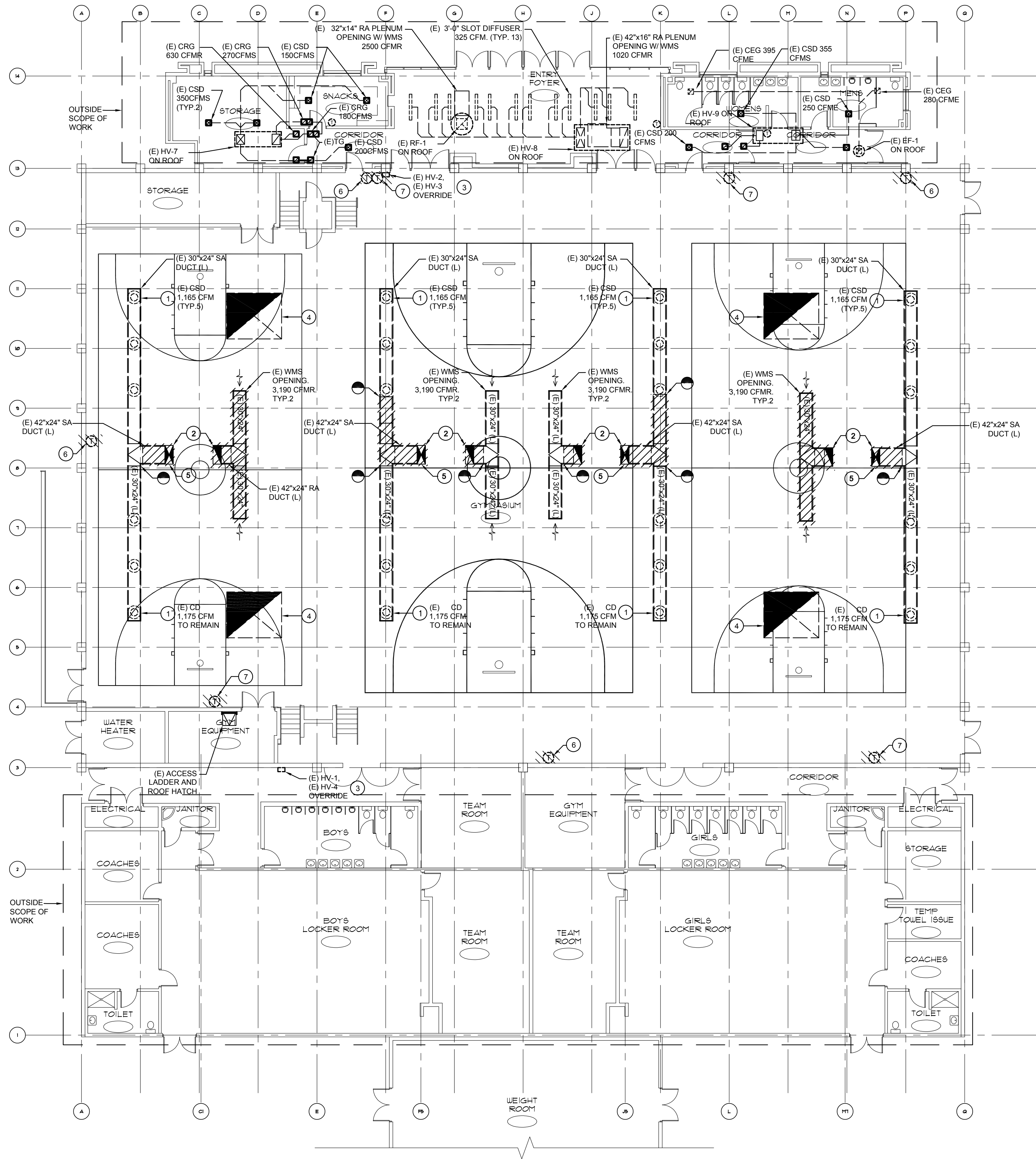
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T24 COMPLIANCE
FORMS

DRAWING NO.:

M0.5

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MECHANICAL FLOOR PLAN



SCALE:
3/32"=1'-0"

1

GENERAL NOTES

- EXISTING CONDITIONS WHERE OBTAINED FROM AS-BUILT DRAWINGS. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTING BID AND COMMENCING ANY WORK. CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING OF ANY DEVIATIONS EFFECTING THE WORK.
- CONTRACTOR SHALL EXAMINE ALL RENOVATION DRAWINGS AND VERIFY EXISTING CONDITIONS TO UNDERSTAND SCOPE OF WORK (POINTS OF DISCONNECTION, POINTS OF CONNECTION, ETC.) PRIOR TO ANY DEMOLITION.
- REMOVE ASSOCIATED HANGERS, SUPPORTS, AND ANCHORS OF DEMOLISHED EQUIPMENT OR DEVICES.
- PROVIDE PERMANENT MECHANICALLY FASTENED SHEET METAL, AIRTIGHT CAPS FOR ALL REMAINING DUCTWORK OPENINGS AFTER ANY DEMOLITION OF DUCTWORK.
- REPAIR OR REPLACE ALL INSULATION REMOVED OR DAMAGED AS A RESULT OF DEMOLITION.
- ALL PIPE, DUCT AND SHAFT OPENINGS NOT REUSED SHALL BE CAPPED, FILLED AND SEALED TO MATCH EXISTING CONSTRUCTION WITHIN SCOPE OF WORK.
- ALL DEMOLITION MATERIAL SHALL BE PROMPTLY REMOVED FROM PROJECT SITE AND DISPOSED OF. EQUIPMENT OR DEVICES IN FAIR CONDITION SHALL BE COORDINATED WITH THE BUILDING OWNER OFFICIAL PRIOR TO DISPOSAL.
- CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR MAINTAINING THE INTEGRITY AND CONTINUITY OF THE EXISTING SYSTEMS. ANY DISRUPTION AND/OR DAMAGE CAUSED BY THE CONTRACTOR SHALL BE RESTORED/REPAIRED AT NO COST TO THE OWNER.

DEMOLITION KEY NOTES

- EXISTING DUCTWORK AND AIR DISTRIBUTION TO REMAIN.
- (E) DUCT PENETRATION THROUGH ROOF TO BE PATCHED AND SEALED TO MATCH SURROUNDING AREA.
- EXISTING OVERRIDE SWITCH TO BE LEFT IN PLACE. CONNECTION TO HV TO BE DISCONNECTED FOR RECONNECTION TO NEW AHU. SEE SHEET M2.3.
- (E) 72"x96" EXHAUST AIR DUCT TO REMAIN. CLEAN DUCT AND GRILL.
- (E) SUPPLY DUCT SMOKE DETECTOR TO BE DEMOLISHED.
- REMOVE (E) OCCUPANT LEVEL (WITHIN 4'-0" AFF) ALERTON CONTROL MODULE AND ASSOCIATED CONTROL WIRING. CONDUIT TO REMAIN TO BE REUSED.
- REMOVE (E) HIGH LEVEL (ABOVE 8'-0" AFF) ALERTON CONTROL MODULE AND ASSOCIATED CONTROL WIRING AND CONDUIT. WALL AND ANY HOLES TO BE PATCHED TO MATCH SURROUNDING AREA.

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PROJECT:

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GYM

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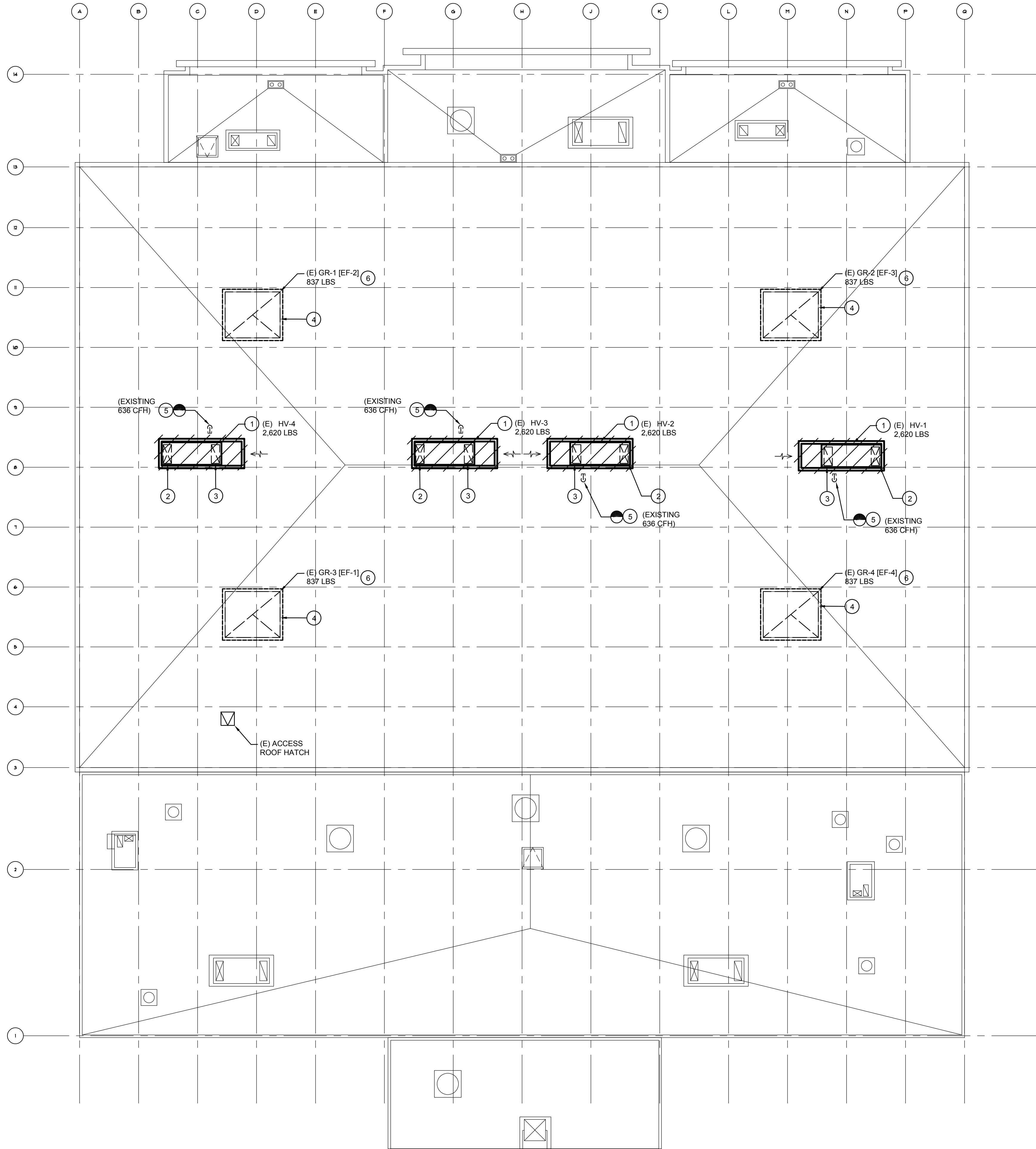
DRAWING TITLE:

MECHANICAL
DEMOLITION
FLOOR PLAN

DRAWING NO.:

M2.1

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SCALE:
3/32"=1'-0"

1

GENERAL NOTES

- EXISTING CONDITIONS WHERE OBTAINED FROM AS-BUILT DRAWINGS. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTING BID AND COMMENCING ANY WORK. CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING OF ANY DEVIATIONS EFFECTING THE WORK.
- CONTRACTOR SHALL EXAMINE ALL RENOVATION DRAWINGS AND VERIFY EXISTING CONDITIONS TO UNDERSTAND SCOPE OF WORK (POINTS OF DISCONNECTION, POINTS OF CONNECTION, ETC.) PRIOR TO ANY DEMOLITION.
- REMOVE ASSOCIATED HANGERS, SUPPORTS, AND ANCHORS OF DEMOLISHED EQUIPMENT OR DEVICES.
- PROVIDE PERMANENT MECHANICALLY FASTENED SHEET METAL, AIRTIGHT CAPS FOR ALL REMAINING DUCTWORK OPENINGS AFTER ANY DEMOLITION OF DUCTWORK.
- REPAIR OR REPLACE ALL INSULATION REMOVED OR DAMAGED AS A RESULT OF DEMOLITION.
- ALL PIPE, DUCT AND SHAFT OPENINGS NOT REUSED SHALL BE CAPPED, FILLED AND SEALED TO MATCH EXISTING CONSTRUCTION WITHIN SCOPE OF WORK.
- ALL DEMOLITION MATERIAL SHALL BE PROMPTLY REMOVED FROM PROJECT SITE AND DISPOSED OF, EQUIPMENT OR DEVICES IN FAIR CONDITION SHALL BE COORDINATED WITH THE BUILDING OWNER OFFICIAL PRIOR TO DISPOSAL.
- CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR MAINTAINING THE INTEGRITY AND CONTINUITY OF THE EXISTING SYSTEMS. ANY DISRUPTION AND/OR DAMAGE CAUSED BY THE CONTRACTOR SHALL BE RESTORED/REPAIRED AT NO COST TO THE OWNER.

DEMOLITION KEY NOTES

- EXISTING HV UNIT TO BE DEMOLISHED, IN ADDITION TO ASSOCIATED CURB, ECONOMIZER HOOD, AND CONTROLS WIRING.
- REMOVE (E) 48"x24" SUPPLY AIR DUCT AT BOTTOM OF UNIT. REFER TO FLOOR PLANS FOR DEMO'D DUCT CONTINUATION. DUCT PENETRATION TO BE PATCHED AND SEALED TO MATCH SURROUNDING AREA PER DETAILS 3/SO.2 & 3/A1.3.
- REMOVE (E) 48"x24" RETURN AIR DUCT AT BOTTOM OF UNIT. REFER TO FLOOR PLANS FOR DEMO'D DUCT CONTINUATION. DUCT PENETRATION TO BE PATCHED AND SEALED TO MATCH SURROUNDING AREA PER DETAILS 3/SO.2 & 3/A1.3.
- (E) 72"x96" EXHAUST AIR DUCT PENETRATION DOWN THROUGH ROOF AND EXHAUST FAN TO REMAIN. CONTRACTOR SHALL CLEAN FANS (TYP-4).
- DISCONNECT AND CAP EXISTING GAS LINE FOR FUTURE USE.
- EXISTING ROOFTOP EXHAUST FAN TO BE LEFT IN PLACE. ORIGINALLY NOTED AS GRAVITY VENTILATORS ON ORIGINAL MECHANICAL AS-BUILTS. EQUIPMENT WEIGHTS ORIGINALLY NOTED AS 837 LBS.

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CONSULTANT:

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ENGINEERS

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www.pbsengineers.com Job no. 2021-191-00

CONSULTANTS STAMP:



SCHOOL DISTRICT:

SAN DIMAS
SCHOOL
DISTRICT

PROJECT:

SAN DIMAS HS
GYM

JOB NUMBER: 12.03.01

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

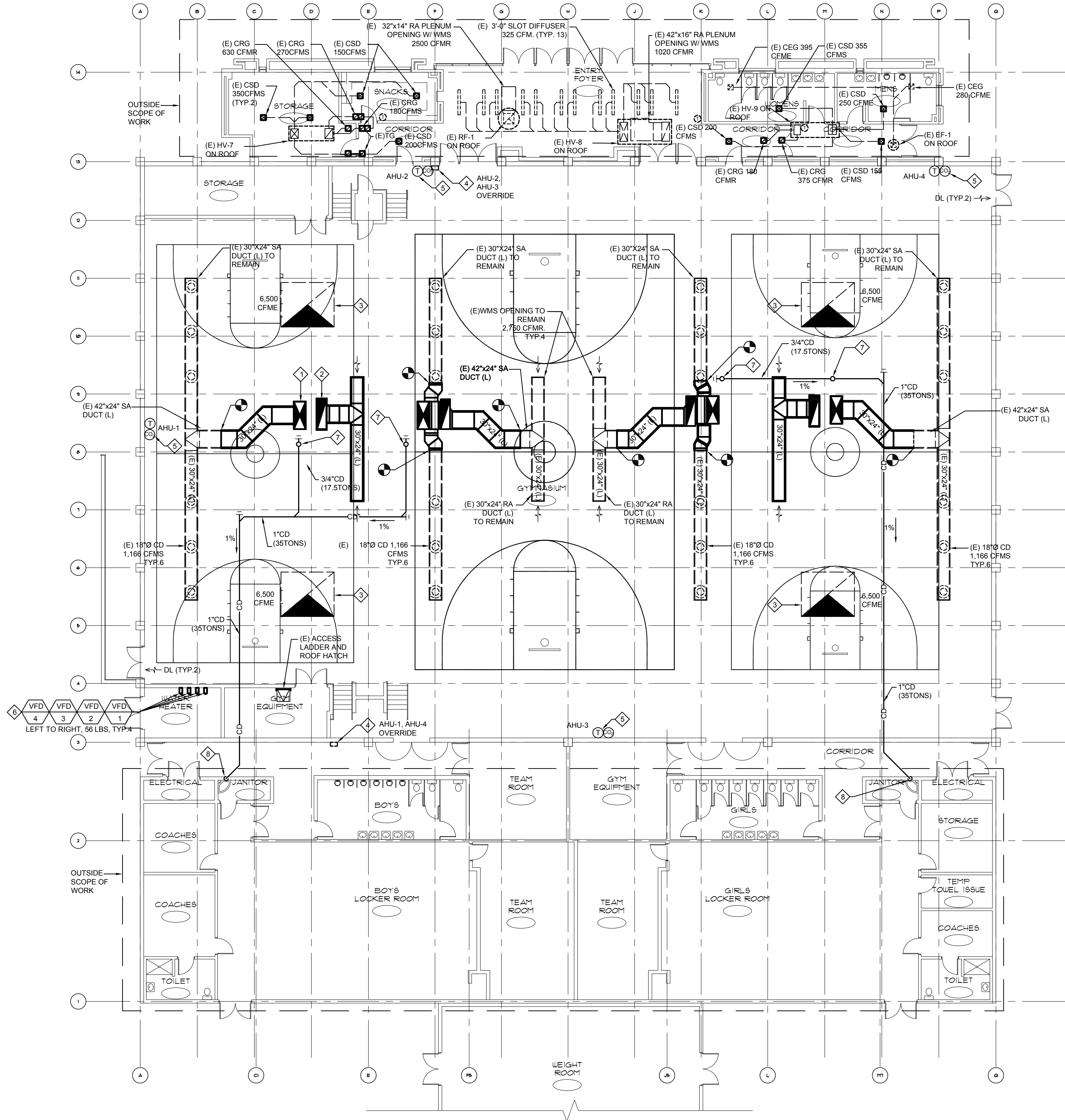
MECHANICAL
DEMOLITION
ROOF PLAN

DRAWING NO.:

M2.2

MECHANICAL ROOF PLAN

P:\P-2021\2021-191-00 BUSD San Dimas HS-Gym HVAC Upgrade\10_BIM-CAD\MEP\2.3.dwg 9/19/2022 6:02 PM Charles Cruz



MECHANICAL REMODEL FLOOR PLAN



SCALE:
3/32"=1'-0"

1

GENERAL NOTES

1. PROVIDE FINAL AIR BALANCE REPORT TO ENGINEER FOR REVIEW AND APPROVAL.
2. PROVIDE ALL EXPOSED DUCTS WITH 1" INTERNAL LINER. INCREASE DUCT SIZE AS NEEDED TO PROVIDE INSIDE CLEAR DIMENSIONS AS SHOWN ON PLANS WHILE PROVIDING REQUIRED LINING AND INSULATION.
3. PROVIDE MANUFACTURERS MIN. REQ'D CLEARANCES AROUND MECHANICAL EQUIPMENT AND CONTROL PANELS.
4. PROVIDE MANUAL VOLUME DAMPERS ON EACH SUPPLY AND RETURN DUCT BRANCH.
5. ANY SQUARE DUCT MITERED ELBOWS ON SUPPLY OR RETURN DUCT MAINS SHALL BE PROVIDED WITH SMOOTH TURNING VANES.
6. INSTALL THERMOSTAT, SENSORS, OR SWITCHES PER MOUNTING DETAIL AS SHOWN ON M0.1.
7. CONDENSATE AND REFRIGERANT LINE ROUTING SHALL NOT PASS ABOVE ANY ELECTRICAL, TELECOMMUNICATIONS, OR SECURITY EQUIPMENT.
8. PROVIDE REFRIGERANT LINES WITHIN ELECTRICAL, IT/AV, OR CONTROL ROOMS WITH 1" TALL DRAIN PANS UNDERNEATH.

REMODEL KEY NOTES

- 1 (E) 61'-5/8"x24'-1/2" SUPPLY AIR DUCT CONNECT TO NEW AHU UNITS. PROVIDE FLEX DUCT CONNECTOR PER DETAIL 3M3.3.
- 2 (E) 68'-1/8"x19'-1/4" RETURN AIR DUCT CONNECT TO NEW AHU UNITS. PROVIDE FLEX DUCT CONNECTOR PER DETAIL 3M3.3.
- 3 (E) 72"x96" EXHAUST AIR DUCT PENETRATION UP THROUGH ROOF. BALANCE EXHAUST AIR CFM TO 6,500.
- 4 EXISTING OVERRIDE SWITCH TO BE LEFT IN PLACE. CONNECTION TO AHU TO BE REESTABLISHED.
- 5 PROVIDE NEW THERMOSTAT AND CO2 SENSOR W/ LOCKING COVER. PROVIDE CONTROL WIRING AND UTILIZE EXISTING CONDUIT TO ESTABLISH CONNECTION W/ EQUIPMENT NOTED ON PLANS.
- 6 WALL MOUNTED PELICAN Z8 CONTROLLER. 1 CONTROLLER PER VFD. ELECTRICAL CONTRACTOR TO PROVIDE 24V TRANSFORMER TO POWER CONTROLLER. INSTALL PER DETAIL 3M3.2.
- 7 3/4" CONDENSATE DRAIN LINE DOWN FROM MECHANICAL UNIT ON ROOF. SEE DETAIL M1/3.1 FOR PIPE SUPPORT DETAIL. SEE SHEET M2.4 FOR CONTINUATION.
- 8 1" CONDENSATE DRAIN LINE DOWN IN WALL AND SPILL TO FLOOR SINK VIA 1" AIR GAP.

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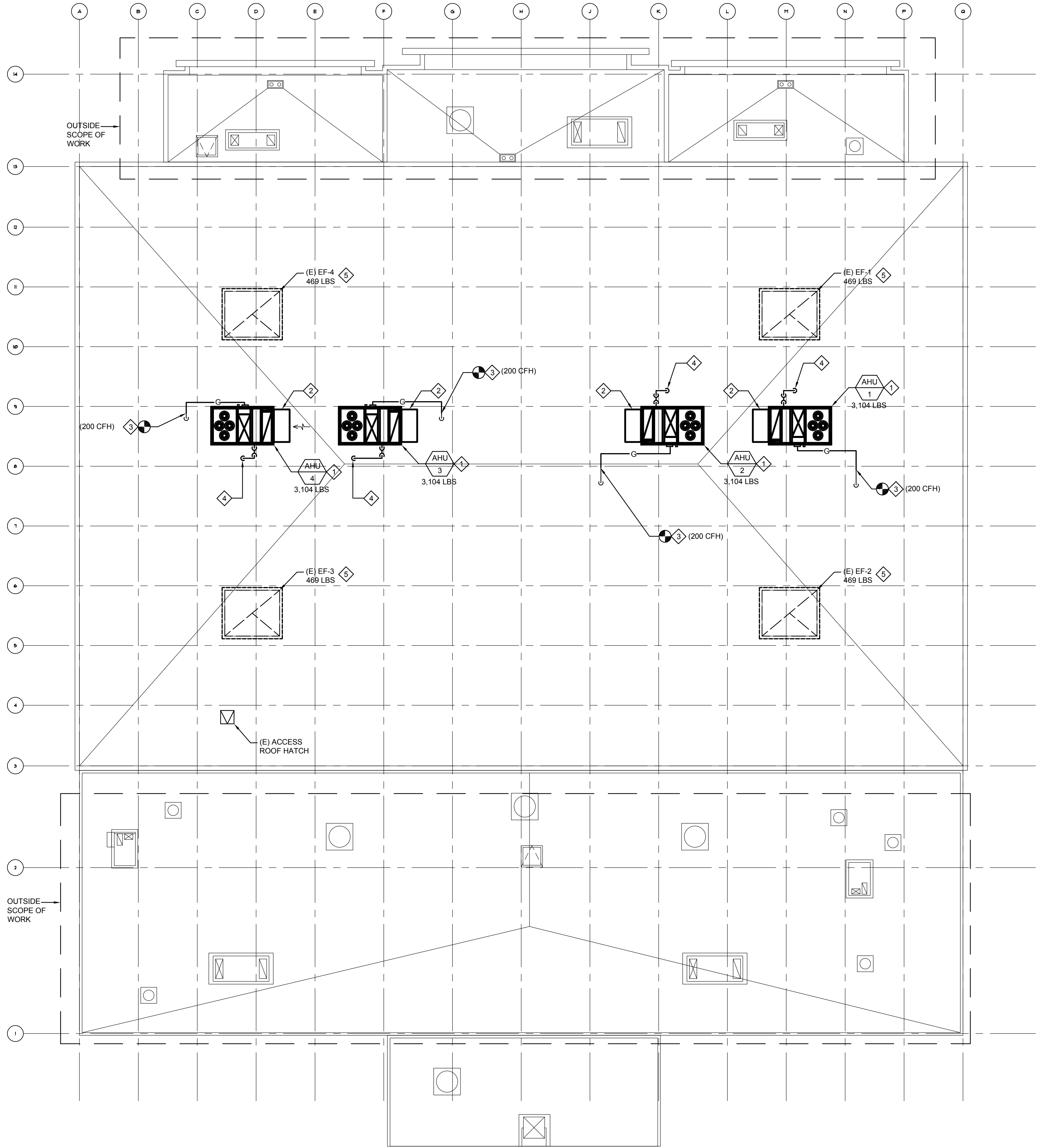
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MECHANICAL
REMODEL
FLOOR PLAN

DRAWING NO.:

M2.3

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- ### GENERAL NOTES
1. PROVIDE FINAL AIR BALANCE REPORT TO ENGINEER FOR REVIEW AND APPROVAL.
 2. PROVIDE ALL EXPOSED DUCTS WITH 1" INTERNAL LINER. INCREASE DUCT SIZE AS NEEDED TO PROVIDE INSIDE CLEAR DIMENSIONS AS SHOWN ON PLANS WHILE PROVIDING REQUIRED LINING AND INSULATION.
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 8. PROVIDE REFRIGERANT LINES WITHIN ELECTRICAL, IT/AV, OR CONTROL ROOMS WITH 1" TALL DRAIN PANS UNDERNEATH.

- ### REMODEL KEY NOTES
- 1 NEW AIR HANDLING UNIT. PROVIDE ON PRE-FAB 14" VIBRATION ISOLATION CURB PER DETAIL 1/M3.2. VIBRATION ISOLATION CALCULATIONS PER DETAIL 2/M3.2. PROVIDE NEW ROOF PENETRATIONS FOR SUPPLY AND RETURN DUCTWORK PER DETAIL 3/S0.2.
 - 2 AHU ECONOMIZER HOOD PER DETAIL 2/M3.3.
 - 3 RECONNECT TO EXISTING GAS LINE ABOVE ROOF. VERIFY IN FIELD FOR EXACT SIZE AND LOCATION AND DETAIL 6/M3.1 FOR CONNECTION DETAIL.
 - 4 3/4" CONDENSATE DRAIN LINE WITH TRAP AND VENT DOWN TO BELOW ROOF. SEE SHEET M2.3 FOR CONTINUATION AND DETAIL 6/M3.1 FOR CONNECTION DETAIL.
 - 5 EXISTING ROOF MOUNTED EXHAUST FAN TO BE MODIFIED WITH DIFFERENT INTERNAL COMPONENTS. WEIGHT TO BE REDUCED TO 469 LBS. REFER TO EQUIPMENT SUBMITTALS PROVIDED PER DETAIL 1/M3.3.



SCALE:
3/32"=1'-0"

1

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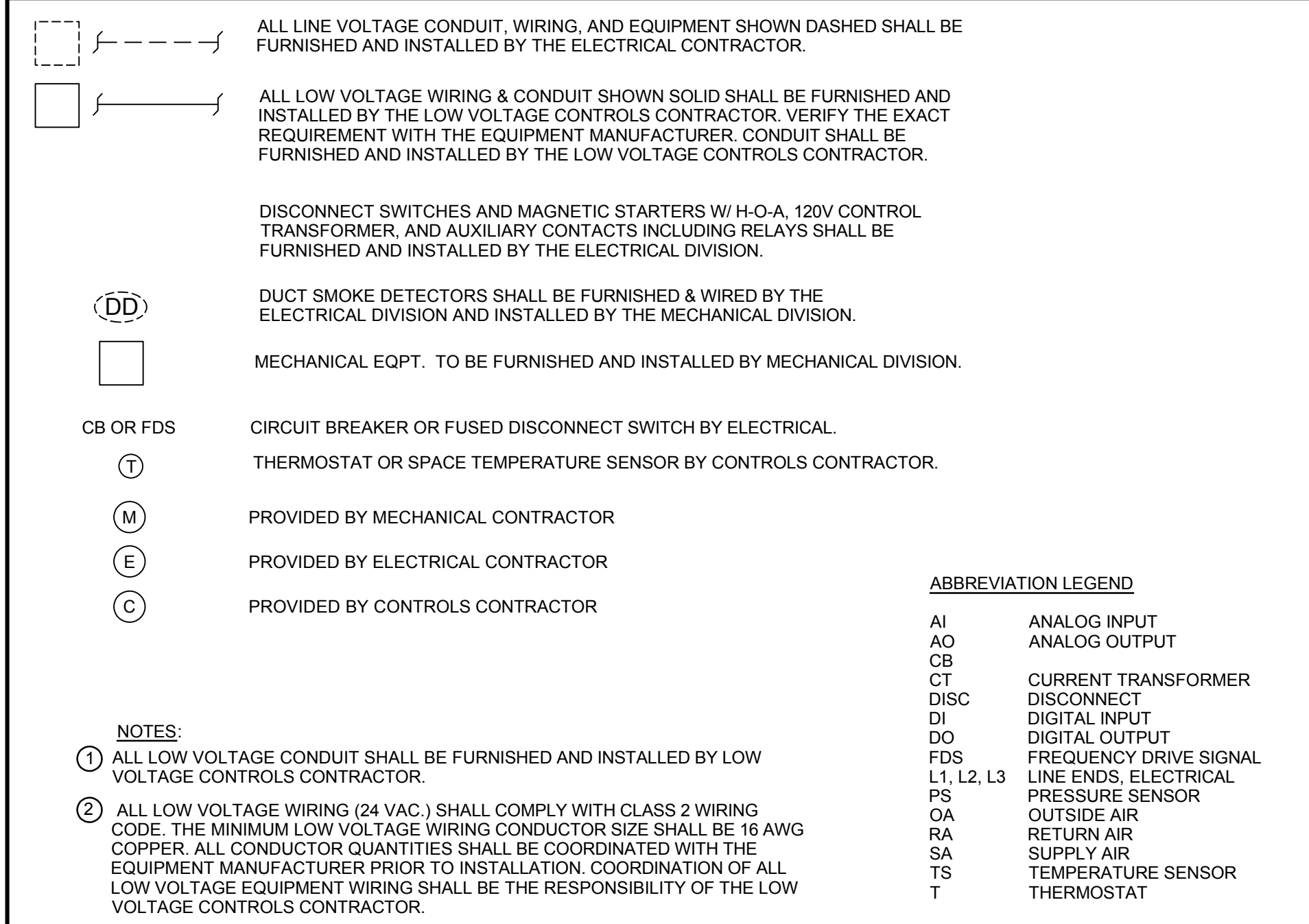
MECHANICAL
REMODEL
ROOF PLAN

DRAWING NO.:

M2.4

MECHANICAL REMODEL ROOF PLAN

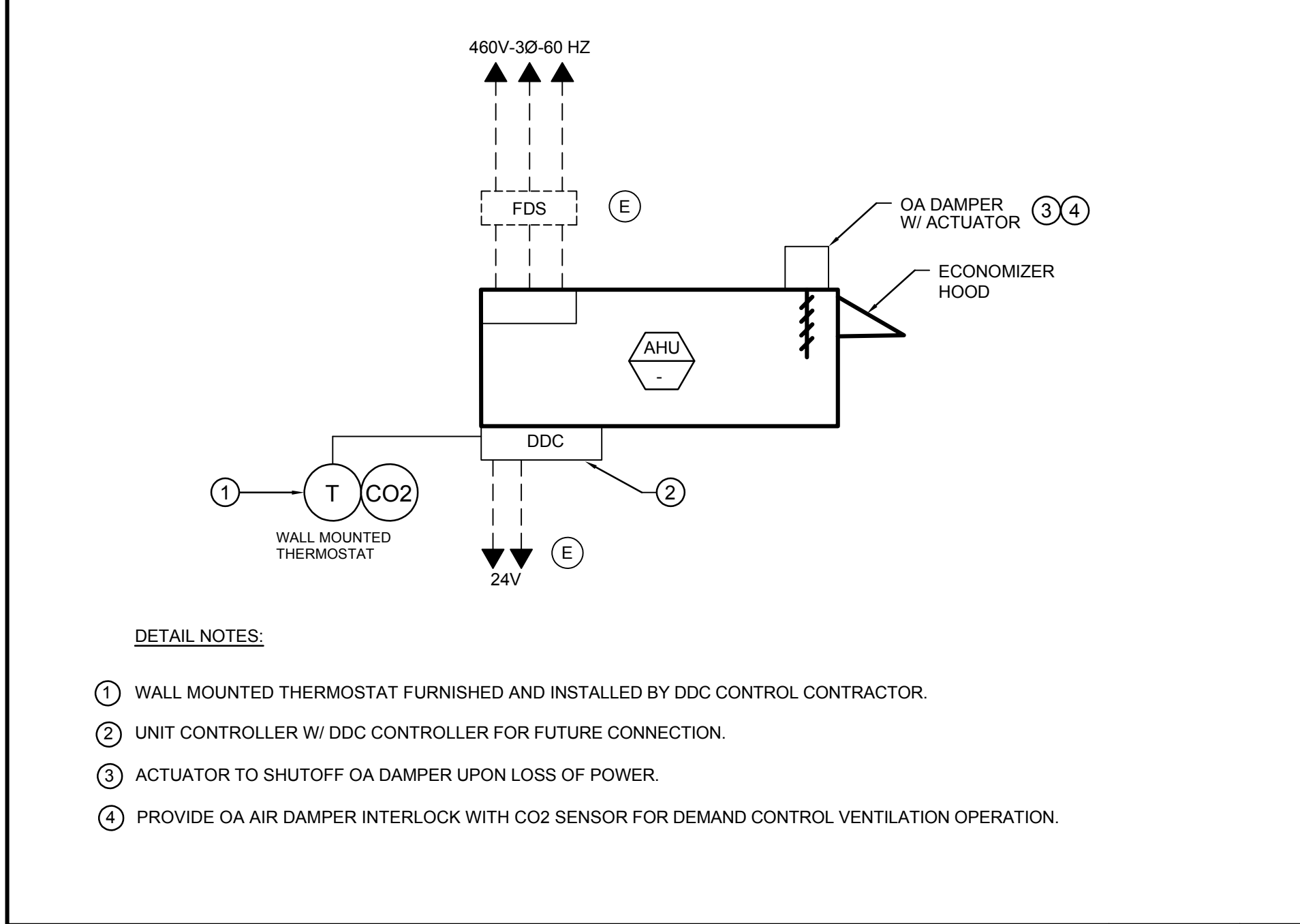
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WIRING LEGEND NOTES

NOT TO SCALE

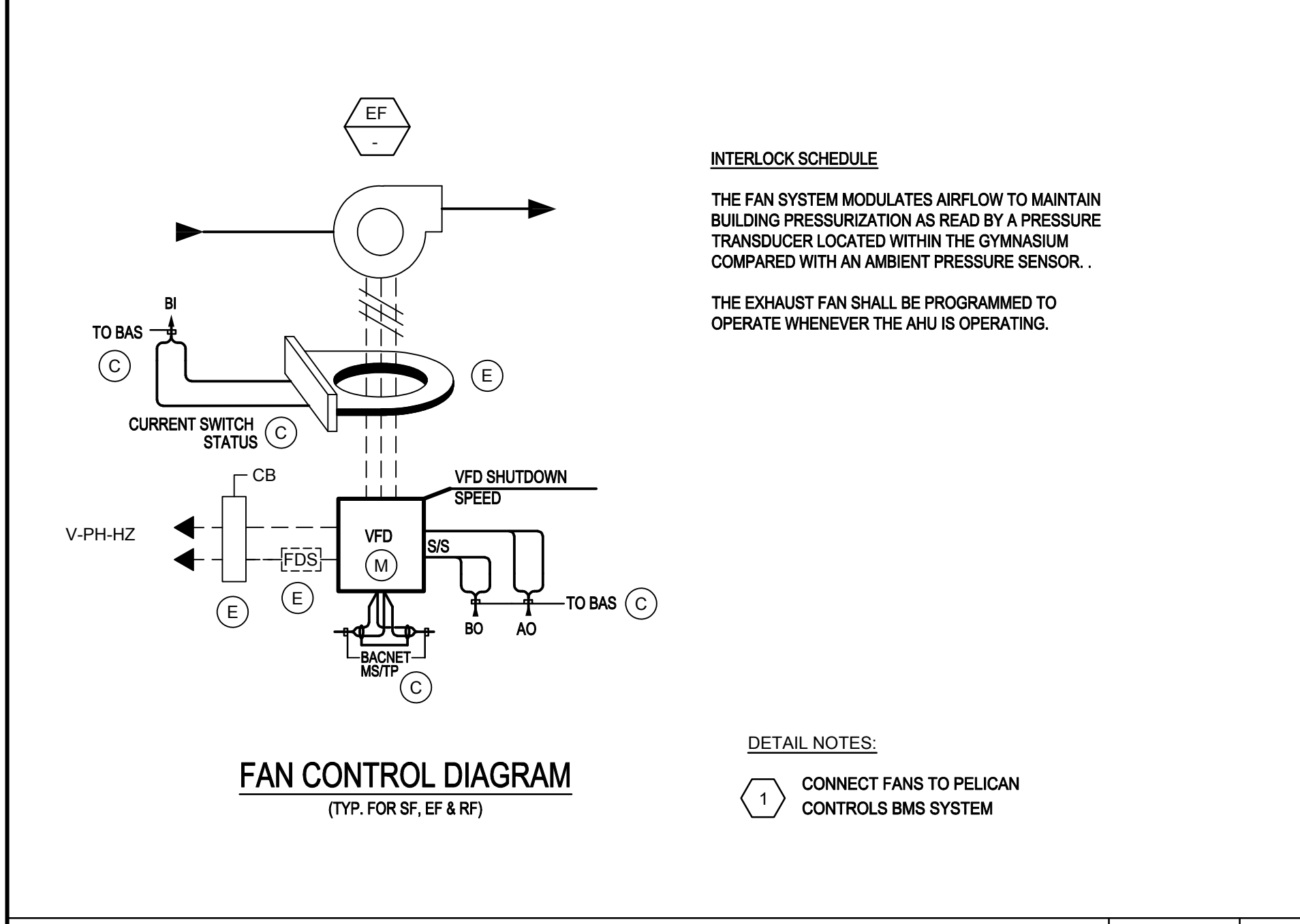
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PACKAGED A/C UNIT WIRING DIAGRAM

NOT TO SCALE

8



EXHAUST FAN WIRING DIAGRAM

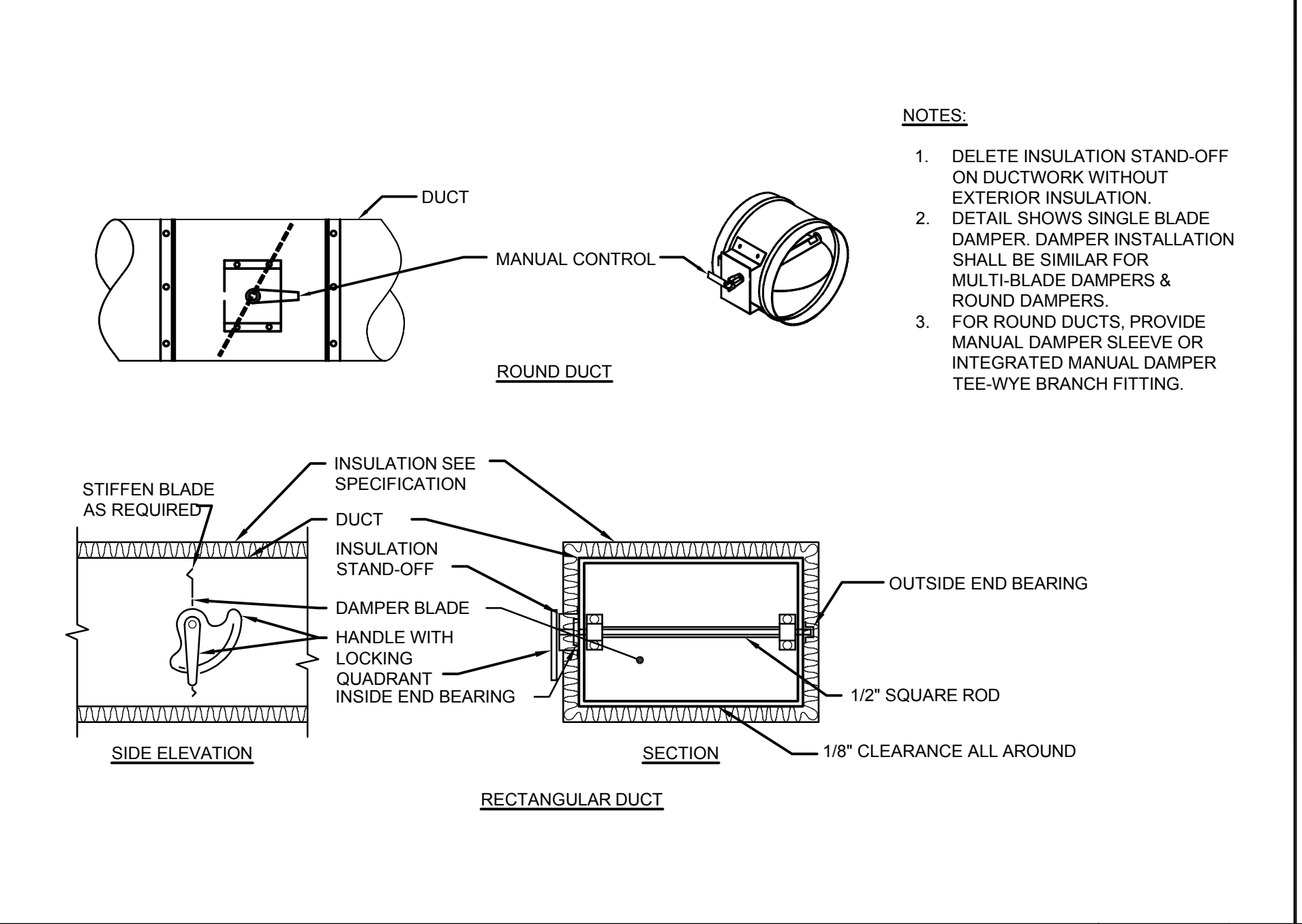
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9

NOT USED

NOT TO SCALE

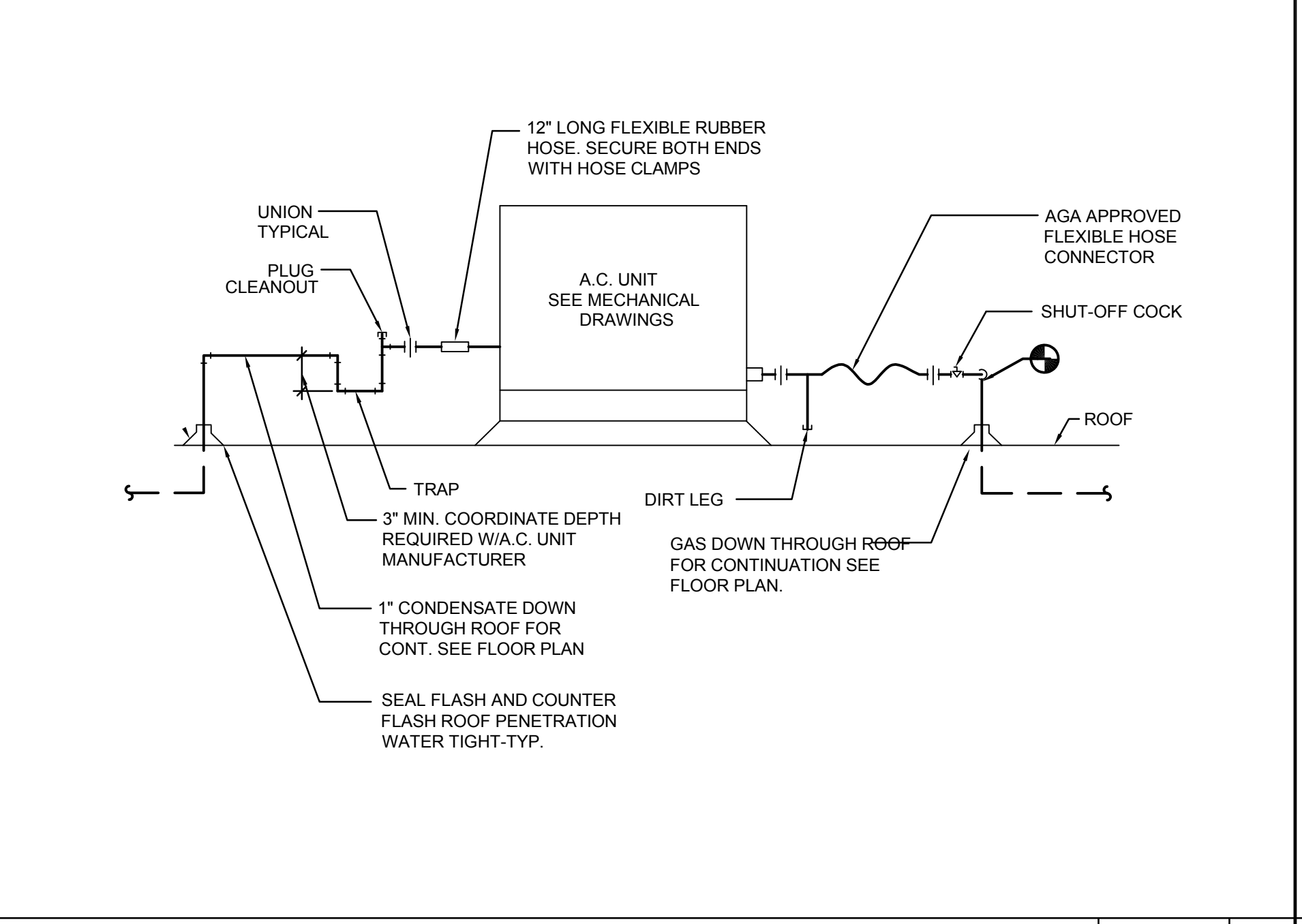
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MANUAL VOLUME BALANCING DAMPER DETAIL

NOT TO SCALE

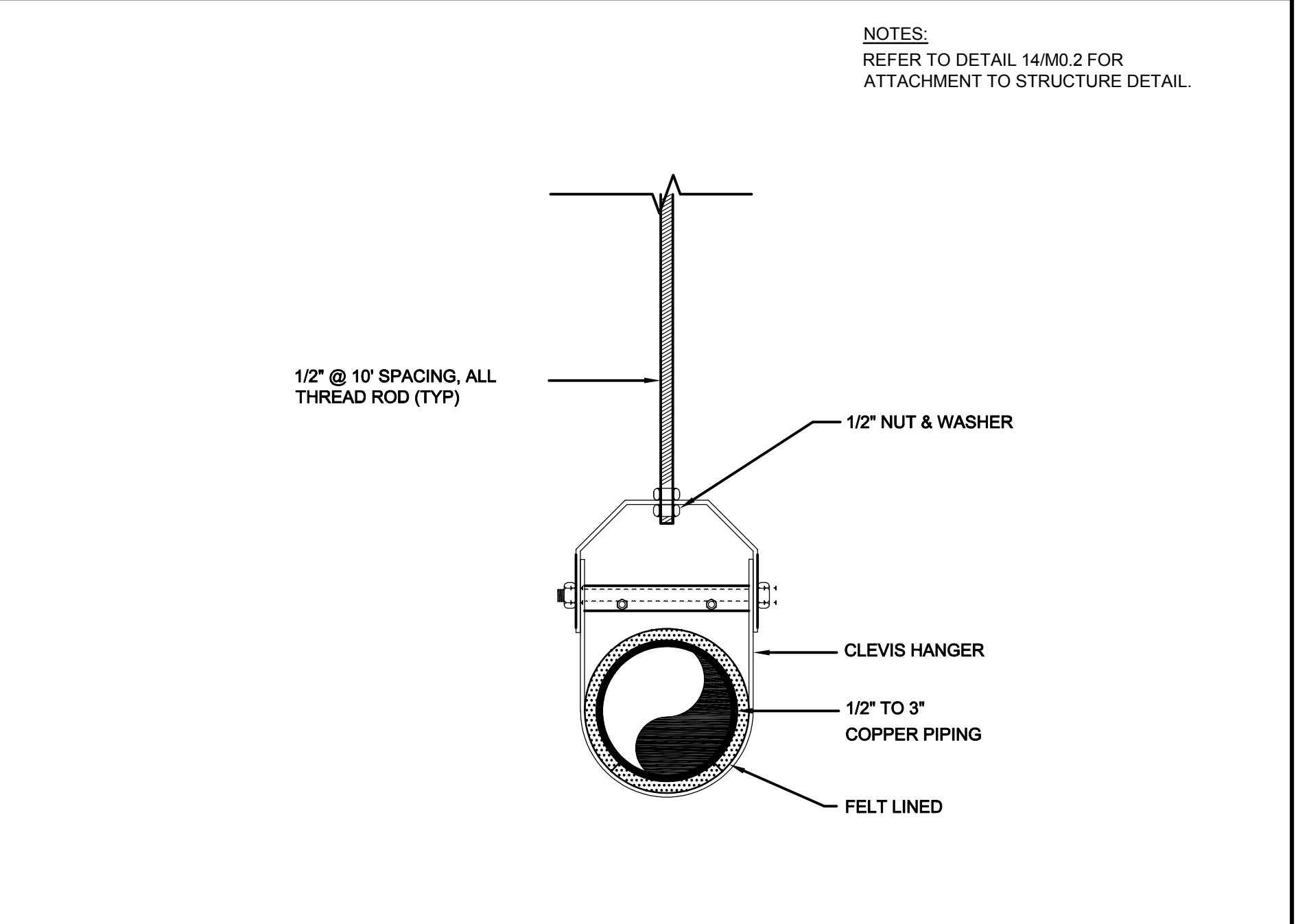
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GAS & CONDENSATE DRAIN TO AC UNIT (ROOF)

NOT TO SCALE

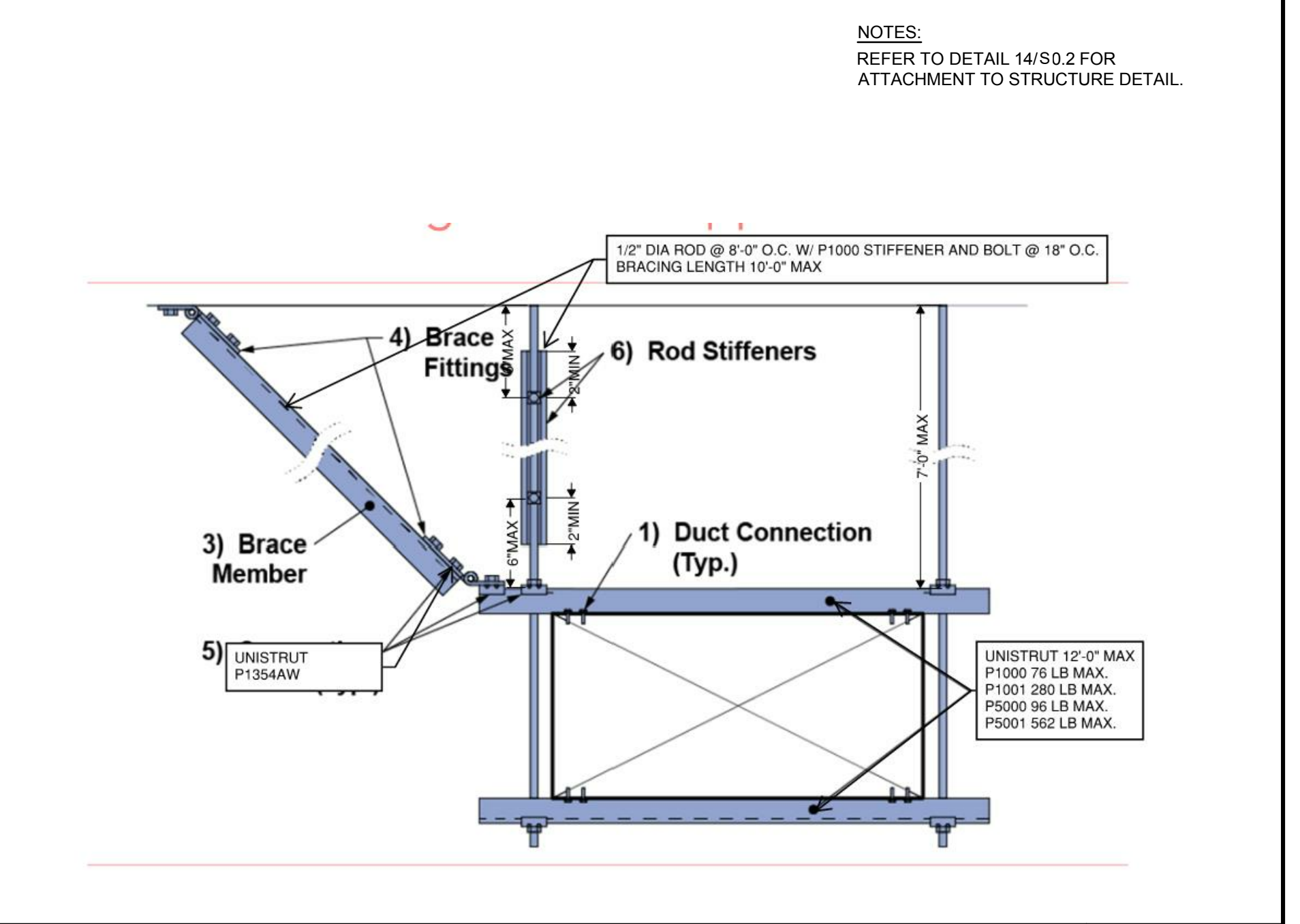
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TYPICAL SINGLE PIPE HANGER DETAIL

NOT TO SCALE

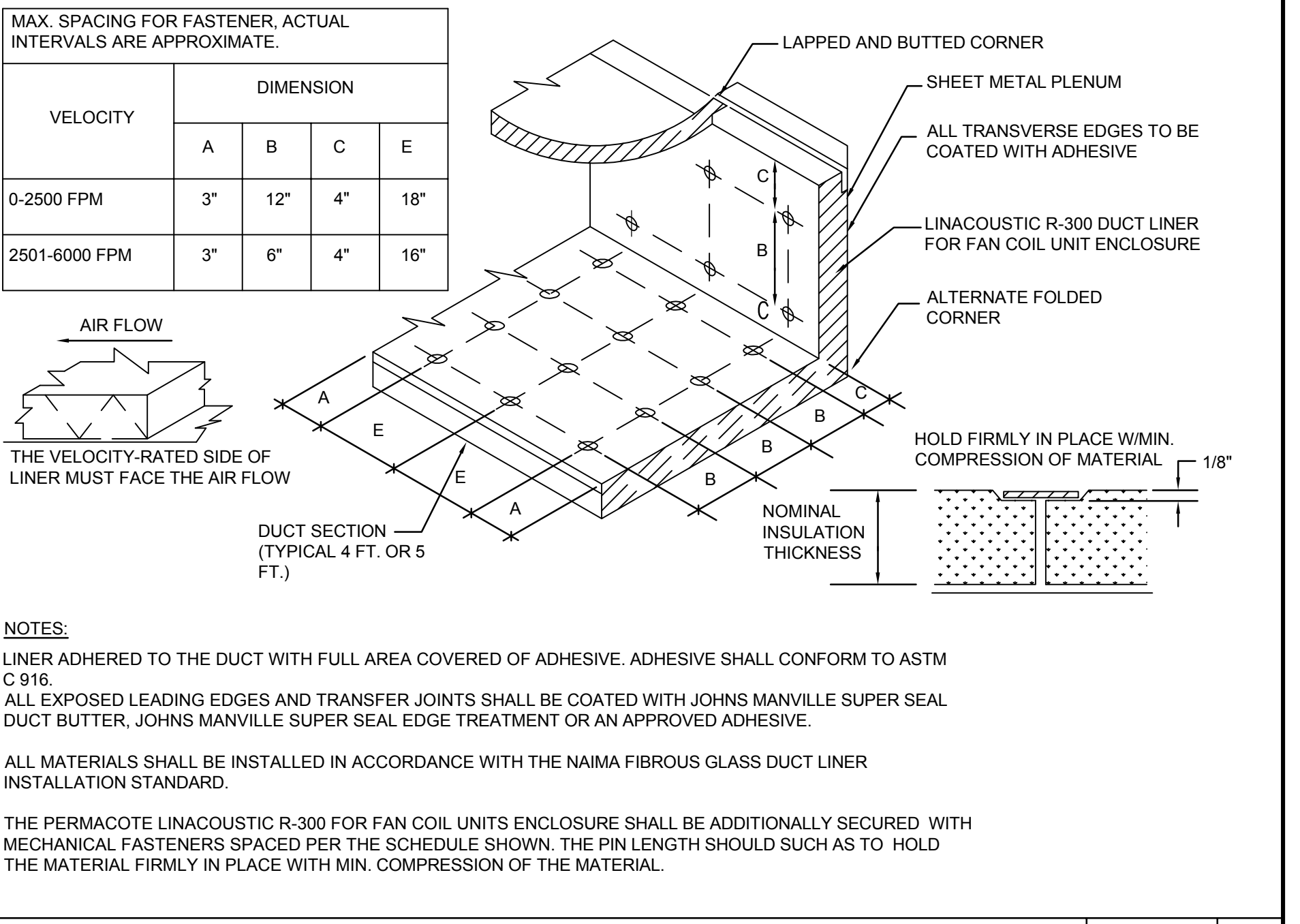
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DUCT SUPPORT DETAIL

NOT TO SCALE

2



DUCT LINER INSTALLATION DETAIL (FOR REFERENCE)

NOT TO SCALE

3

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STEVEN M. GELSINGER
C-28546
5/31/22
RENEWAL DATE

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REGISTERED PROFESSIONAL MECHANICAL ENGINEER
M33827
EXP. 06-30-2023

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PROJECT:

SAN DIMAS HS GYM

JOB NUMBER: 12.03.01
DATE: 2022-01-14

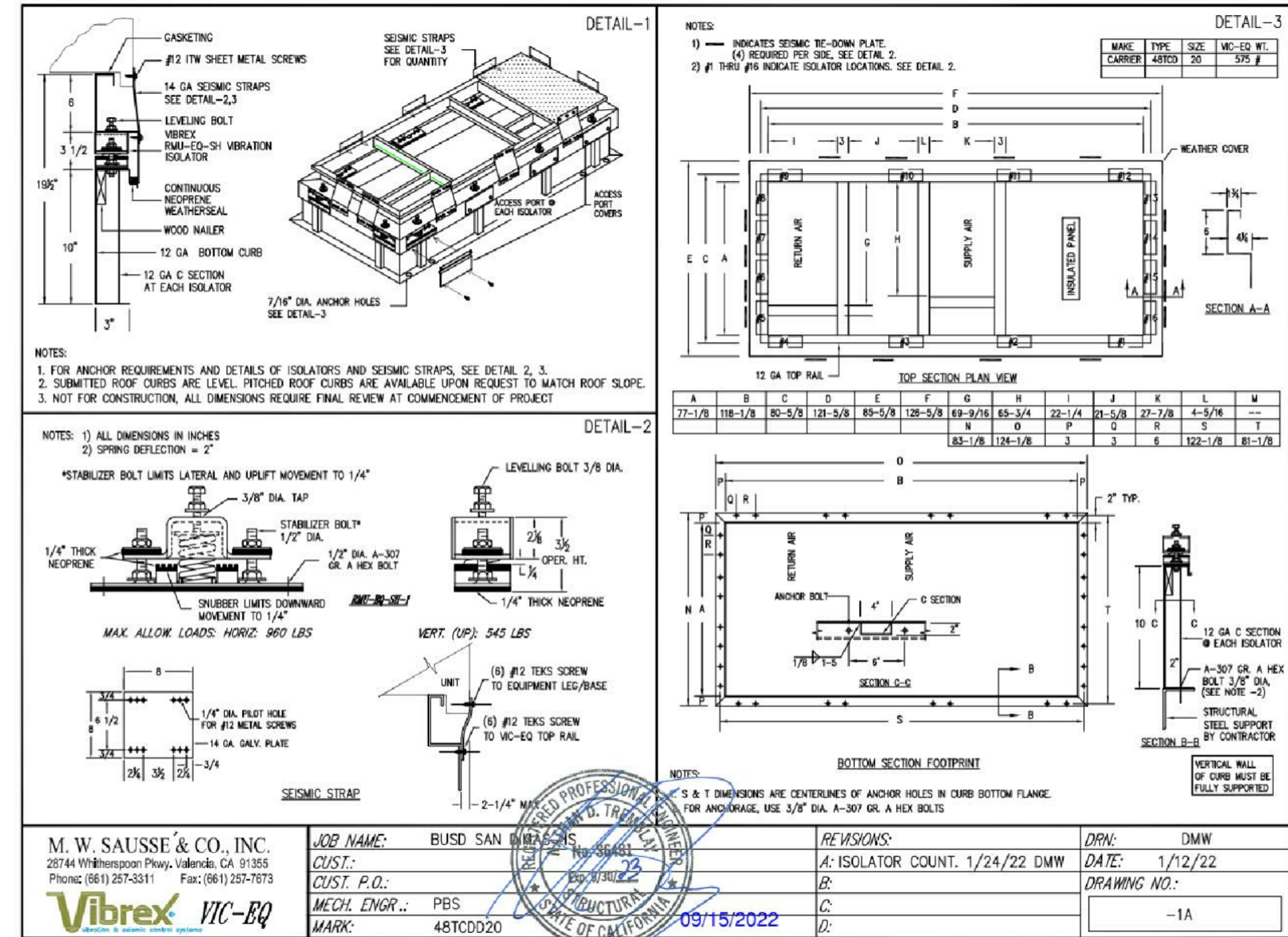
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REVISION: DATE:

DRAWING TITLE:

MECHANICAL DETAILS

DRAWING NO.:

M3.1



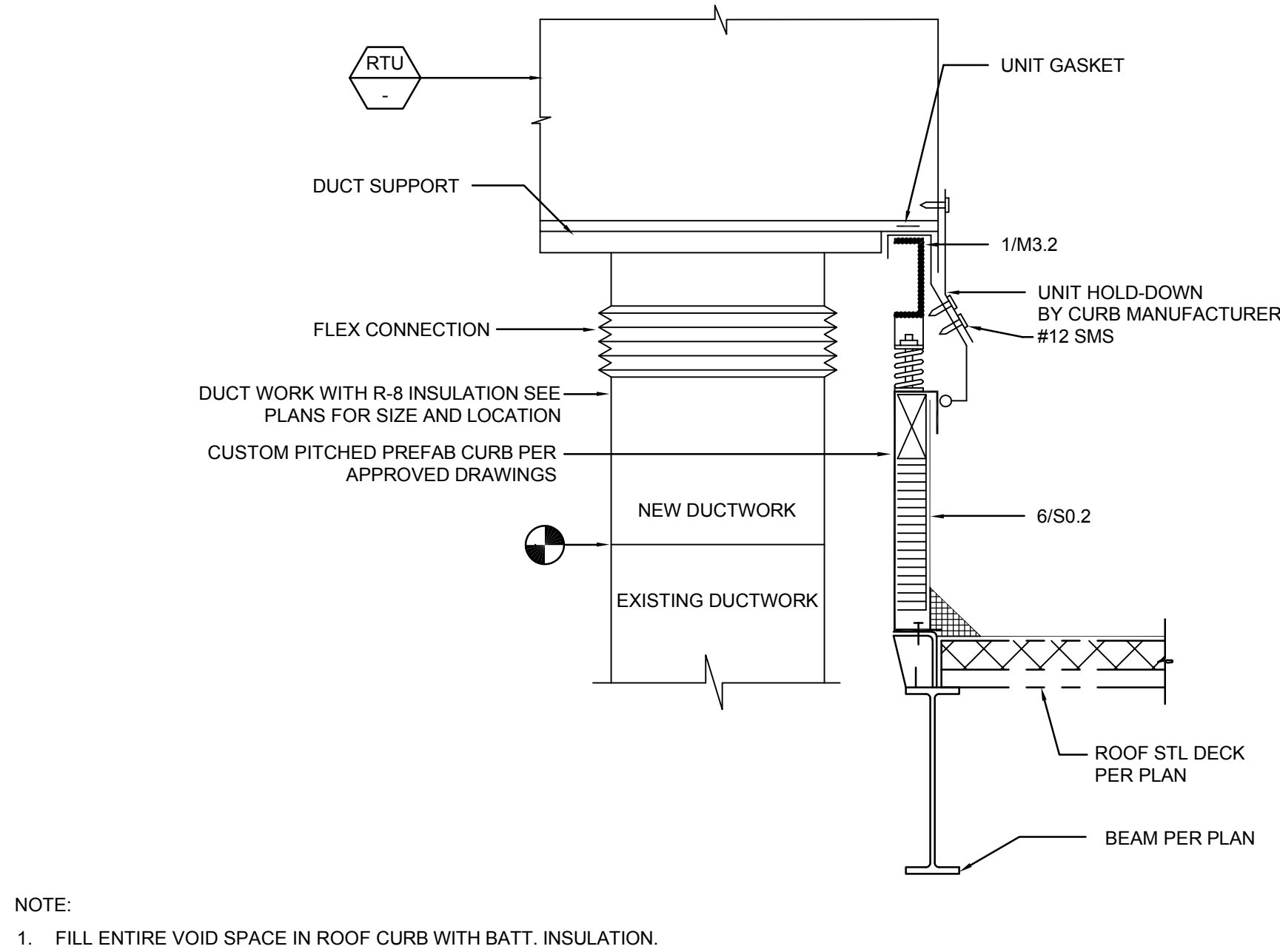
NOT TO
SCALE

M3.2

NOT TO SCALE

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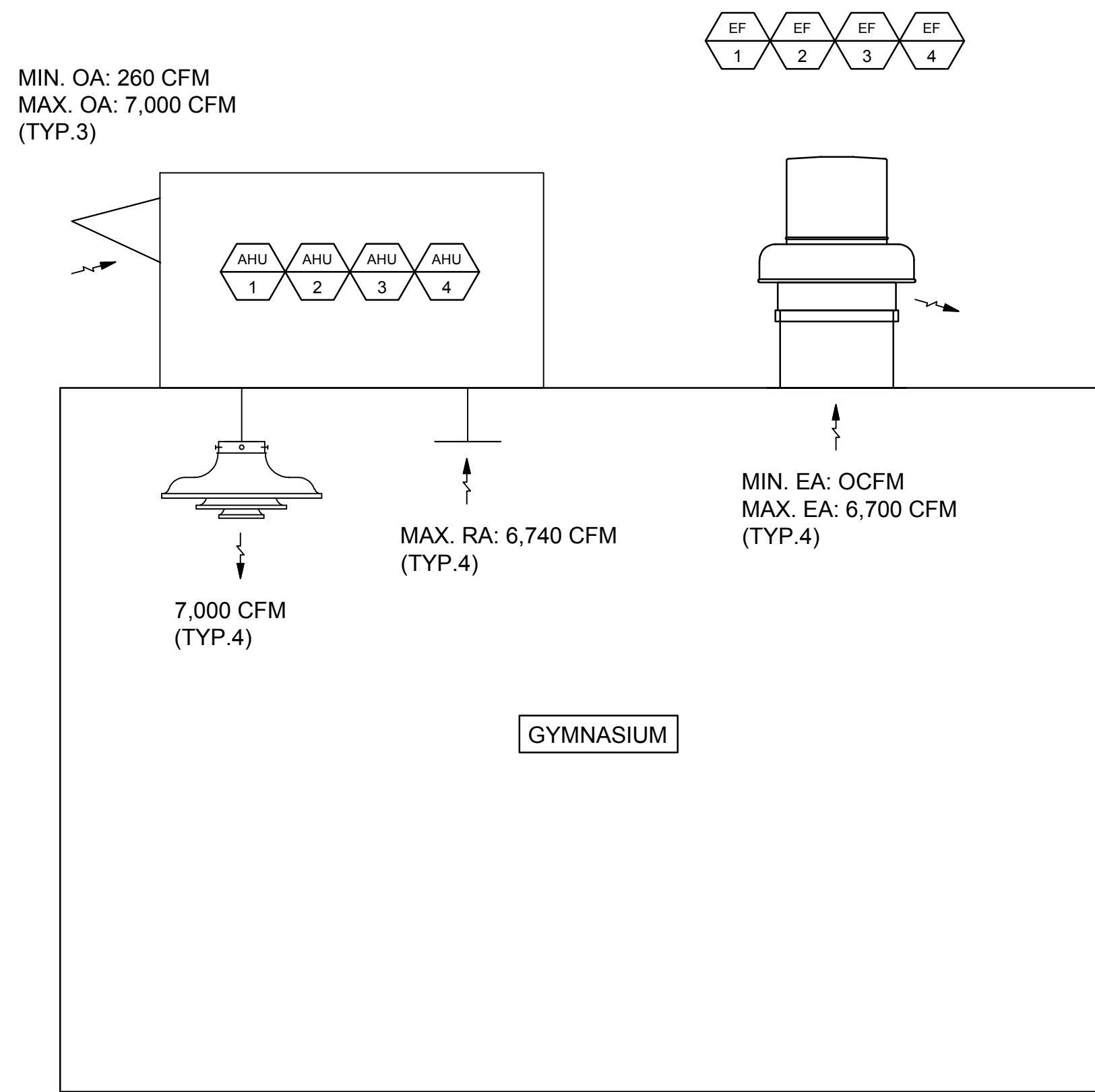
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AIR HANDLING UNIT FLEX DUCT CONNECTION DETAIL

NOT TO SCALE

3



GYMNASIUM BUILDING AIRFLOW DIAGRAM

NOT TO SCALE

4

NEW FAN SELECTION

COOK

MARK: EF-1,2,3,4
PROJECT: SAN DIMAS HIGH SCHOOL
DATE: 4/22/2022

ACE-B
Downblast Centrifugal Exhaust Ventilator
Roof Mounted/Belt Drive

STANDARD CONSTRUCTION FEATURES:
All aluminum housing - Backward inclined all aluminum wheel - Two piece top cap with stainless steel quick release latches - Welded curb cap corners - Birdscreen - Vibration isolators - Lifting Lugs - Permanently lubricated ball bearing motors - Oil and heat resistant, static conducting belts - Adjustable pitch drives through 5 hp motor - Corrosion resistant fasteners - Regreaseable bearings in a cast iron pillow block housing, rated at 200,000 hours average life - All fans factory adjusted to specified fan RPM - Transit tested packaging - Standard motors ship factory installed.

Performance (*Bhp includes 13% drive loss)

Catalog Qty	Flow Number	Flow (CFM)	SP (inwc)	Fan RPM	Power* (HP)	FEG	FEI
4	490C85	6800	125	221	504	1/2<1HP	1.77

Altitude (ft): 105 Temperature (F): 70
Motor Information
HP RPM Volts/Ph/Hz Enclosure FLA Mounted VFD Rated
1-1/2 1725 460/3/60 ODP -PE 3 Yes Yes

Sound Data Inlet Sound Power by Octave Band

1	2	3	4	5	6	7	8	LWA dBA	Sones
79	89	92	91	89	86	80	81	90	5.1

Accessories:
Premium Efficiency Motor (Min. 85.5%)
DRIVES (1.5 SF) @ 221 RPM
WHEEL REDUCED 50% - BANDED
80-48 DAMPER
ROOF CURB RCG 52 9 SH -C+T+N
BELT TENSION-ROTARY

Dimensions (inches)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
11-1/2	75-3/16	58-13/16	59-3/8	3	54	49-1/2																			

Fan Curve (MaxRPM Non-Reinforced Wheel = 360)

Fan Curve Legend
CFM vs SP
CFM vs HP
Point of Operation
System Curve

Weight(lbs) Shipping [54] Unit [414]**

Performance (*Bhp includes 10% drive loss)

Catalog Qty	Flow Number	Flow (CFM)	SP (inwc)	Fan RPM	Power* (HP)	FEG	FEI
4	490C78	10000	250	213	879	1/2<1HP	1.91

Altitude (ft): 105 Temperature (F): 70
Motor Information
HP RPM Volts/Ph/Hz Enclosure FLA Mounted VFD Rated
1 1725 460/3/60 ODP -PE 2.1 Yes Yes

Sound Data Inlet Sound Power by Octave Band

1	2	3	4	5	6	7	8	LWA dBA	Sones
79	89	92	91	89	86	80	81	90	5.1

Accessories:
Premium Efficiency Motor (Min. 85.5%)
DRIVES (1.5 SF) @ 213 RPM
80-48 DAMPER
ROOF CURB RCG 52 9 SH -C+T+N
BELT TENSION-ROTARY

Weight(lbs) Shipping [54] Unit [414]**

Performance (*Bhp includes 10% drive loss)

Catalog Qty	Flow Number	Flow (CFM)	SP (inwc)	Fan RPM	Power* (HP)	FEG	FEI
4	490C78	10000	250	213	879	1/2<1HP	1.91

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Motor Information
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1 1725 460/3/60 ODP -PE 2.1 Yes Yes

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1	2	3	4	5	6	7	8	LWA dBA	Sones
79	89	92	91	89	86	80	81	90	5.1

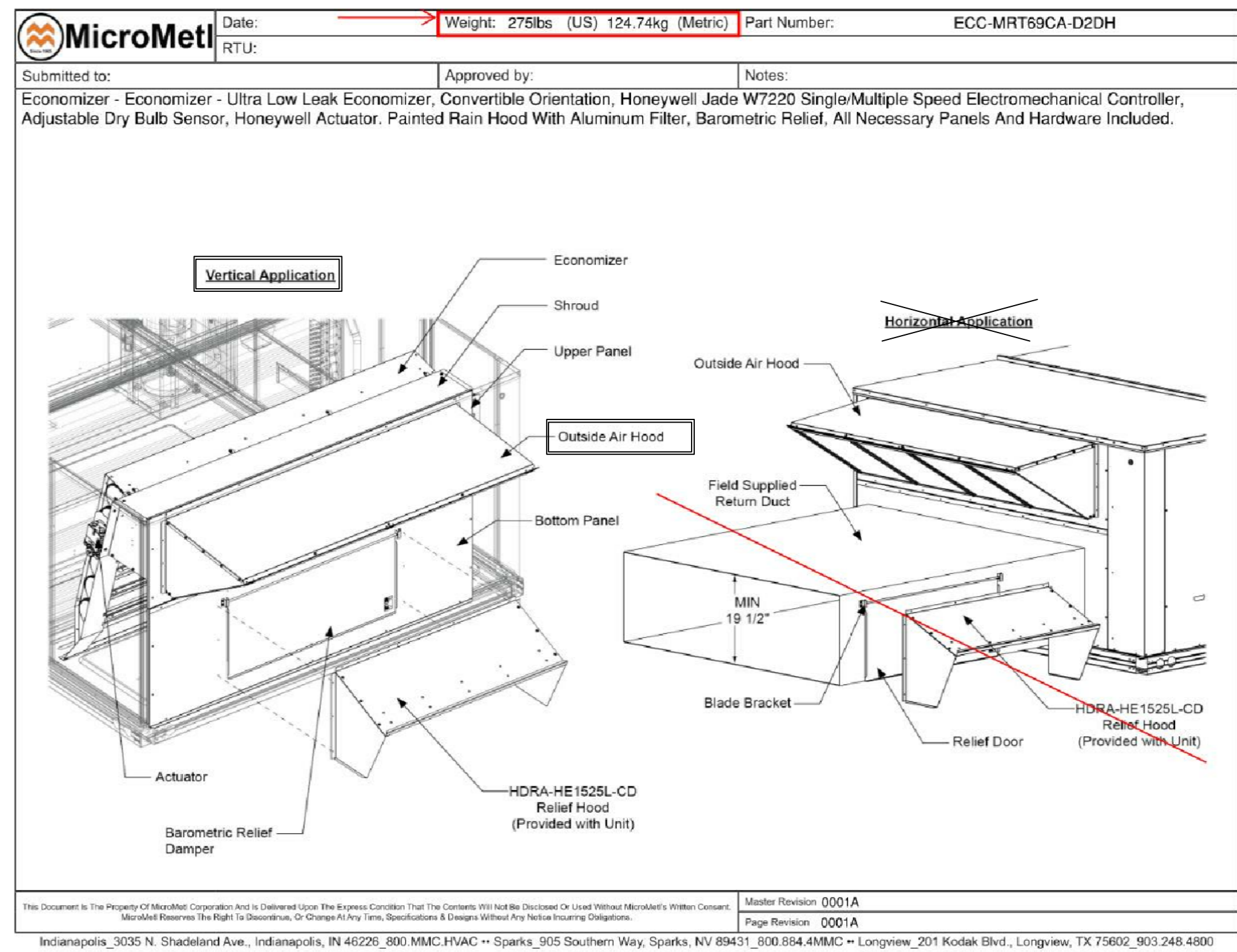
Accessories:
Premium Efficiency Motor (Min. 85.5%)
DRIVES (1.5 SF) @ 213 RPM
80-48 DAMPER
ROOF CURB RCG 52 9 SH -C+T+N
BELT TENSION-ROTARY

Weight(lbs) Shipping [54] Unit [414]**

EXHAUST FAN SUBMITTALS - ORIGINAL SELECTION & NEW SELECTION

NOT TO SCALE

1



AIR HANDLING UNIT ECONOMIZER HOOD

NOT TO SCALE

2

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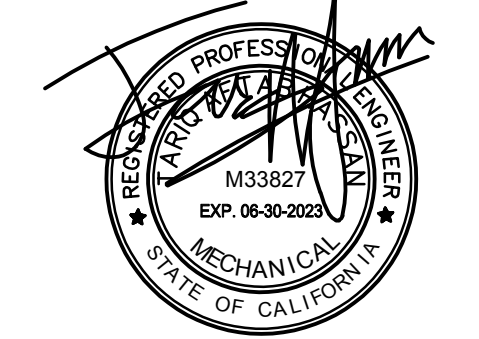


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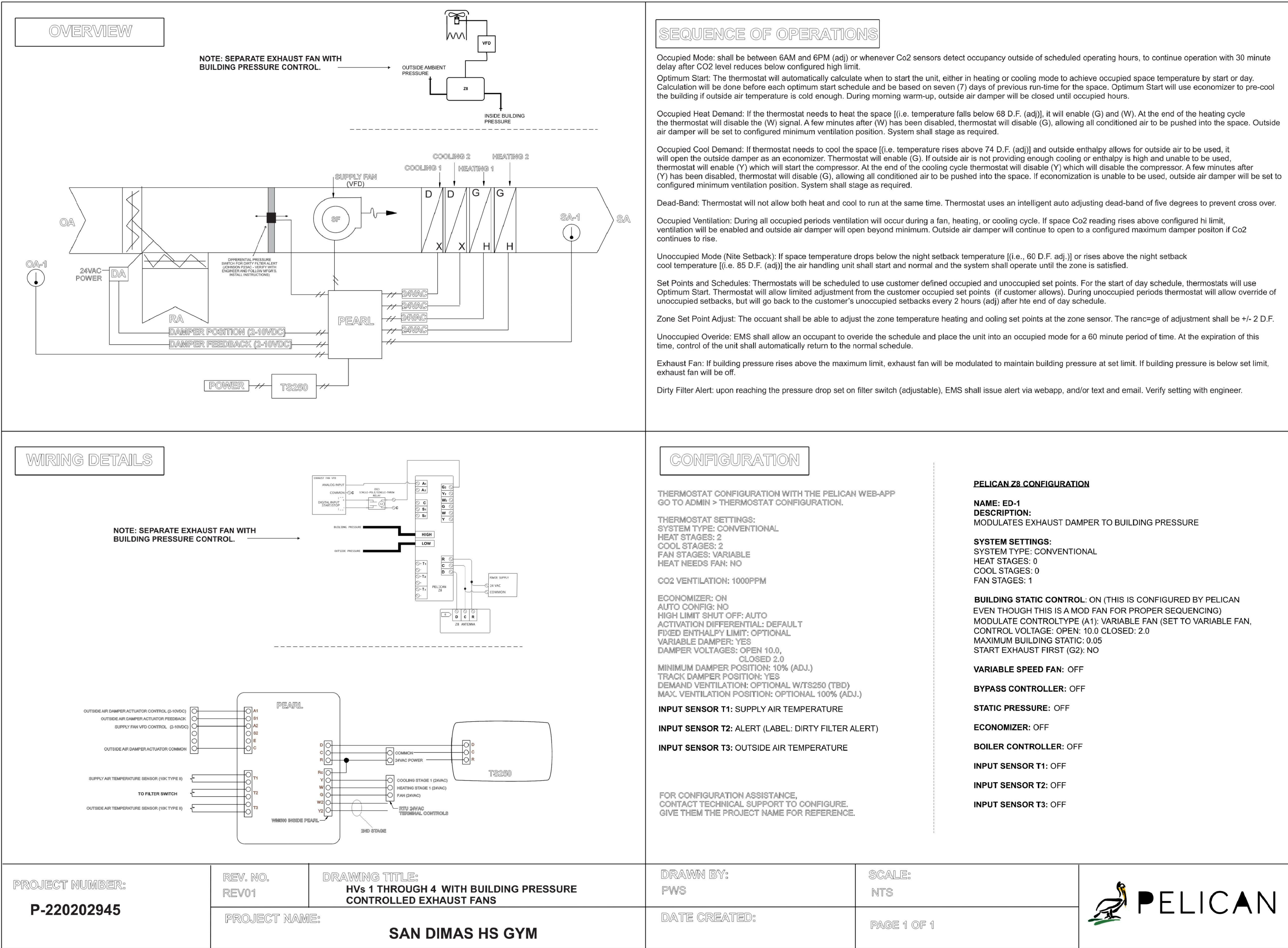
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DRAWING TITLE:

MECHANICAL
DETAILS

DRAWING NO.:

M3.3



PROJECT NUMBER:
P-220202945

REV. NO.
REV01

DRAWING TITLE:
HVs 1 THROUGH 4 WITH BUILDING PRESSURE CONTROLLED EXHAUST FANS

PROJECT NAME:
SAN DIMAS HS GYM

DRAWN BY:
PWS

DATE CREATED:

SCALE:
NTS

PAGE 1 OF 1



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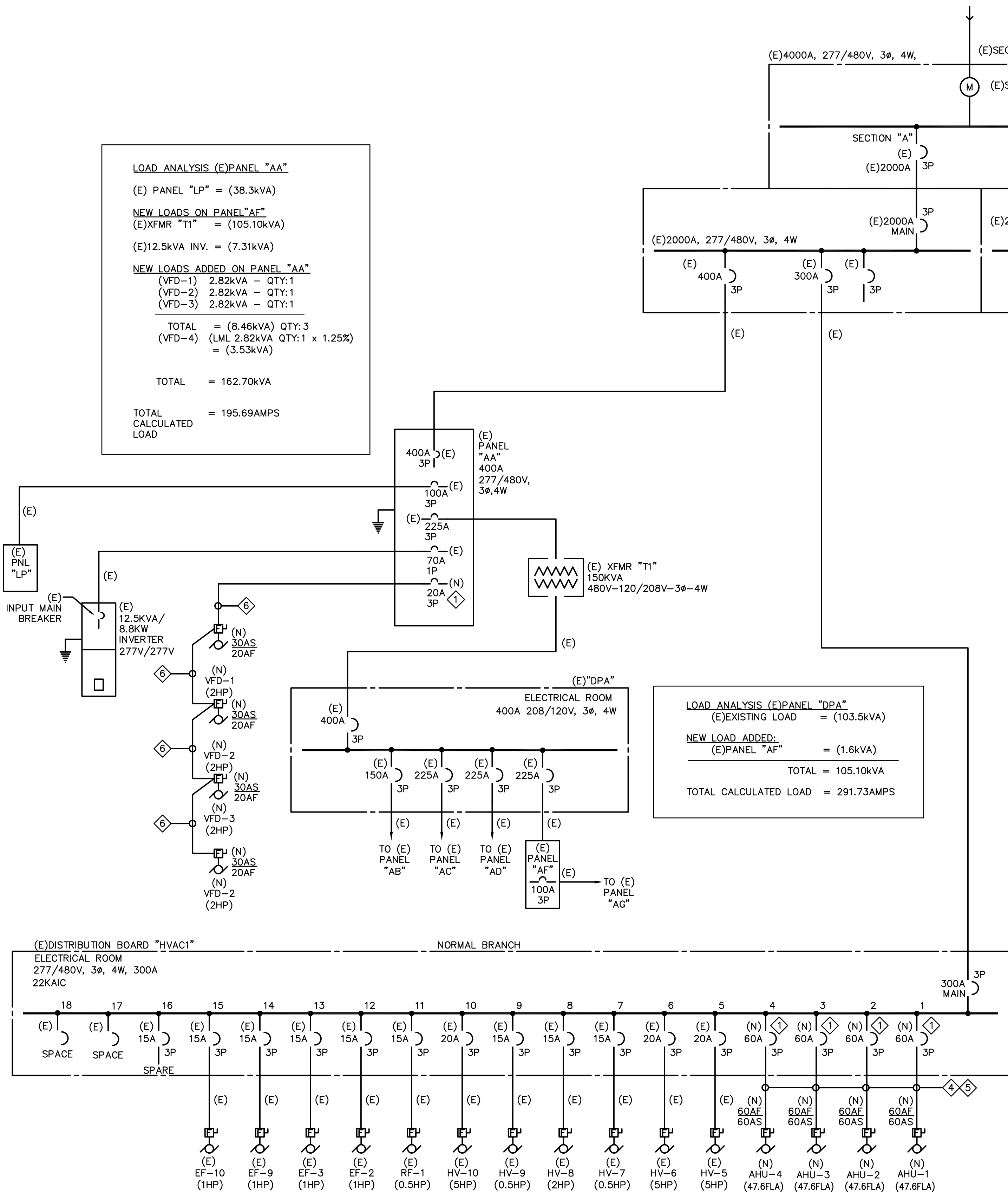
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MECHANICAL
CONTROLS

DRAWING NO.:

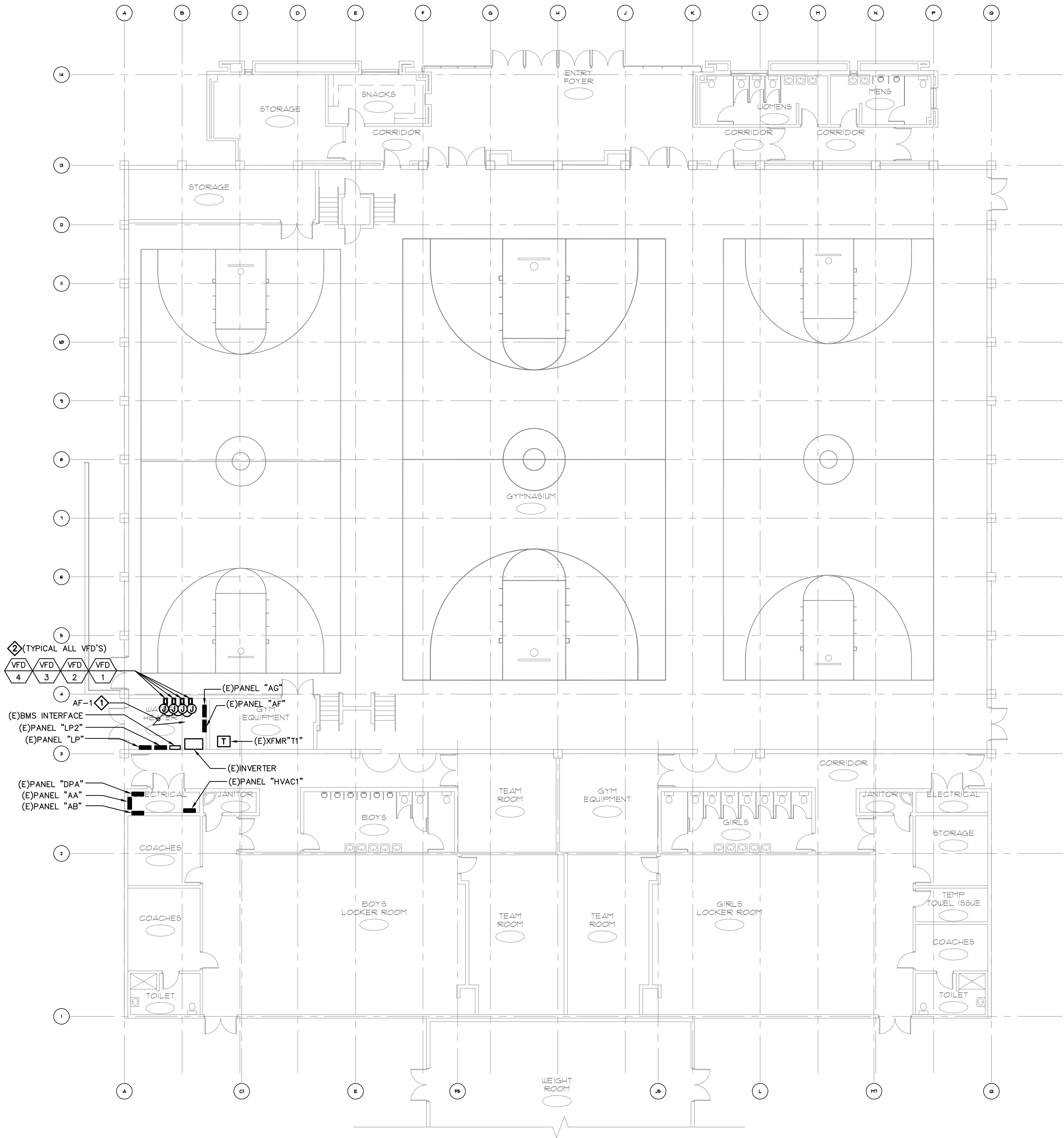
M4.1



MOUNTING: SURFACE		PANEL--(EXISTING)AF		LOCATION:MAIN ELECT ROOM	
VOLTAGE: 120/208V,3ø,4W		14,000 AIC SYM 225 AMP BUS MAIN LUGS ONLY			
DESCRIPTION	VOLT--AMPERES ØA ØB ØC			VOLT--AMPERES ØA ØB ØC	DESCRIPTION
1 VFD CONTROLLER	800	4	1 20 1 2 20 1	540	(E)COACH OFFICES
SPARE			1 20 3 4 20 1	540	(E)COACH OFFICES
SPARE			1 20 5 6 20 1	180	(E)TOILET RECEPT
SPARE			1 20 7 8 20 1	720	(E)RESTRM RECEPTS
1 AHU-1 CONTROLLER	200	1	1 20 9 10 20 1	900	(E)TEAM ROOM REC
1 AHU-2 CONTROLLER	200	1	1 20 11 12 20 1	720	(E)TEAM ROOM REC
1 AHU-3 CONTROLLER	200	1	1 20 13 14 20 1	1125	(E)HAND DRYER
1 AHU-4 CONTROLLER	200	1	1 20 15 16 20 1		SPARE
SPARE			1 20 17 18 20 1		SPARE
(E)AV EQUIP	200	1	1 20 19 20 20 1	1000	(E)PROJ. SCREEN
(E)HVAC RELAY PANEL	400		1 20 21 22 20 1	800	(E)AV SPEAKERS
SPARE			1 20 23 24 20 1	400	(E)AV SPEAKERS
SPARE			1 20 25 26 20 1	600	(E)CC MACHINE
SPARE			1 20 27 28 20 1	400	(E)AV INPUT PANELS
(E)PANEL "AG"	8814		3 100 31 32 20 1	1000	(E)JAM MACHINE
-	7054		- 33 34 20 1	1000	(E)PHOTO FLASH REC
-	9882		- 35 36 20 1	1000	(E)PHOTO FLASH REC
(E)BLEACHER MOTOR	500		3 20 37 38 60 2	4500	WH-1
-	1500		- 39 40 - -	4500	
-			- 41 42 20 1	140	(E)STEP LIGHTS
VA PER PHASE=1514354				948581403040VA PER PHASE	
CONTINUOUS LOAD140 x1.25=175 VA				2099749462	TOTAL VA PER PHASE
+ OTHER=52975 VA				53115	TOTAL CONNECTED VA
TOTAL LOAD=53150 VA					NOTES
148AMPS				1	NEW C.B. TO MATCH EXISTING
CEILING OUTLETS =7				2	
CONV. OUTLETS =				3	
MISC. OUTLETS =8				4	
THIS PANEL IS FED BY:					

LOAD ANALYSIS (E)DISTRIBUTION BOARD "HVAC1"	
(E)EF-10	= (1.74kVA)
(E)EF-9	= (1.74kVA)
(E)EF-3	= (1.74kVA)
(E)EF-2	= (1.74kVA)
(E)RF-1	= (0.91kVA)
(E)HV-10	= (6.31kVA)
(E)HV-9	= (0.91kVA)
(E)HV-8	= 2.82kVA
(E)HV-7	= (0.91kVA)
(E)HV-6	= (6.31kVA)
(E)HV-5	= (6.31kVA)
(N)AHU-4	= (39.5kVA)
(N)AHU-3	= (39.5kVA)
(N)AHU-2	= (39.5kVA)
(N)AHU-1 (39.5kVA x 1.25%)	= (49.37kVA)
TOTAL = 199.30kVA	
TOTAL CALCULATED LOAD = 239.72AMPS	

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KEY NOTES

- 1 REFER TO SHEET E0.3 - SINGLE LINE DIAGRAM FOR POWER REQUIREMENTS AND PANEL SCHEDULE "AF".
- 2 PROVIDE A 24V TRANSFORMER AND 120V CONTROLS FOR ALL VFD'S.



SCALE:
3/32"=1'-0"

1

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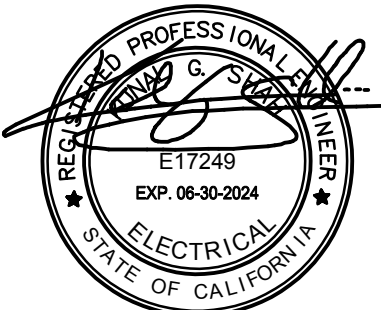


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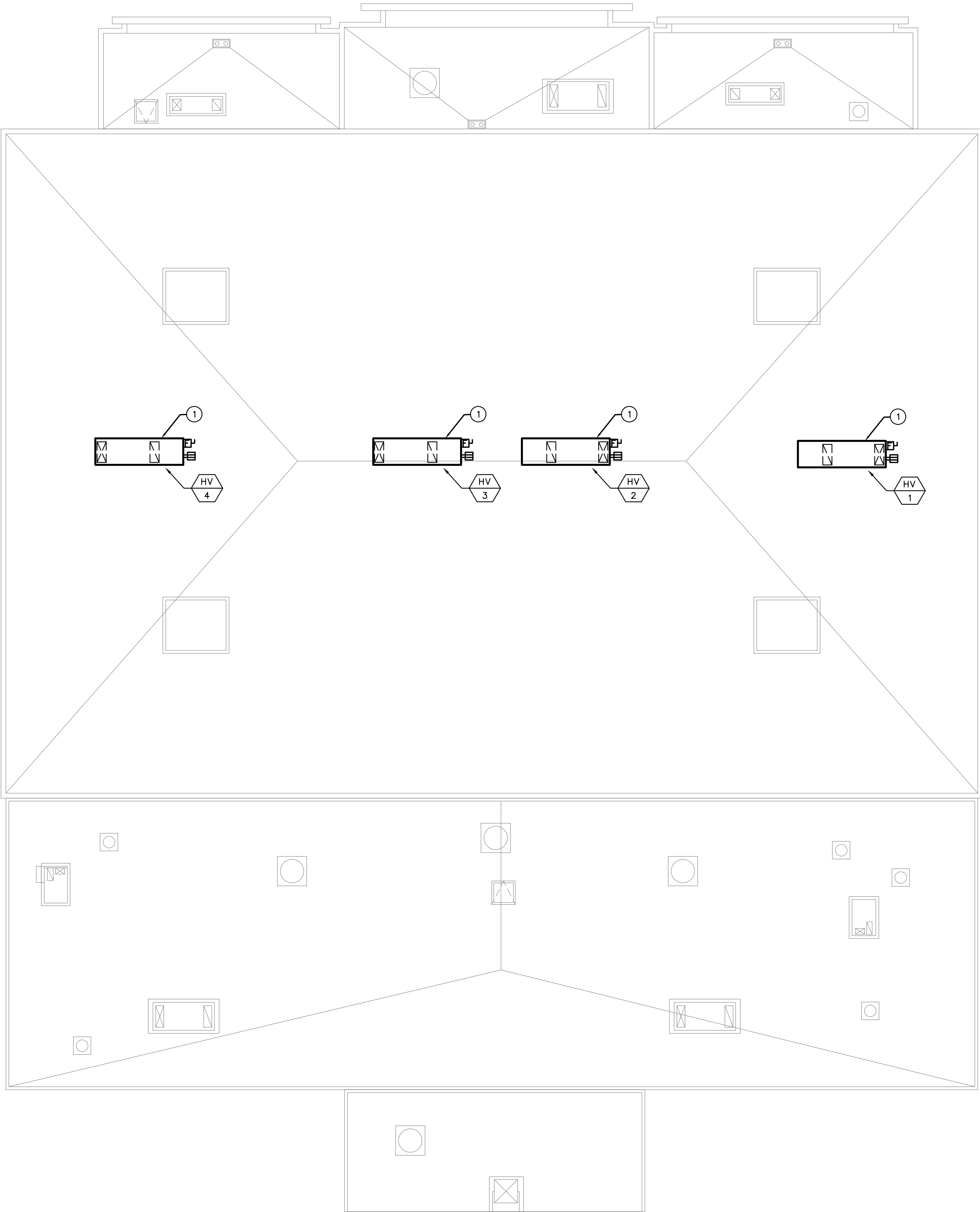
DRAWING TITLE:

ELECTRICAL
FLOOR PLAN

DRAWING NO.:

E2.1

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ELECTRICAL DEMO ROOF PLAN

SCALE:
3/32"=1'-0"

1

GENERAL NOTES

1. CONTRACTOR TO FIELD VERIFY THE EXACT LOCATIONS OF MECHANICAL EQUIPMENT AND CONTROLS.
2. COORDINATE DEMOLITION WORK WITH ALL RELATED DISCIPLINES INCLUDING MECHANICAL.
3. REFER TO DEMOLITION NOTES ON SHEET E0.02 FOR ADDITIONAL INFORMATION.
4. DEMOLITION PLANS ARE DETERMINED FROM MOST CURRENT AS-BUILT DOCUMENTS AVAILABLE. CONTRACTOR TO FIELD VERIFY SITE CONDITIONS PRIOR TO BID.

DEMO KEY NOTES

- ① MECHANICAL CONTRACTOR TO REMOVE UNIT. ELECTRICAL CONTRACTOR IS TO REMOVE DISCONNECT SWITCH, CONDUIT AND WIRING SHALL REMAIN. EXISTING RECEPTACLE IS TO REMAIN.



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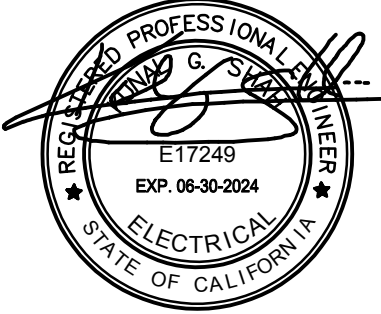


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SCHOOL DISTRICT:

SAN DIMAS
SCHOOL
DISTRICT

PROJECT:

SAN DIMAS HS
GYM

JOB NUMBER: 12.03.01
DATE: 2022-01-14

REVISION: DATE: _____
REVISION: DATE: _____

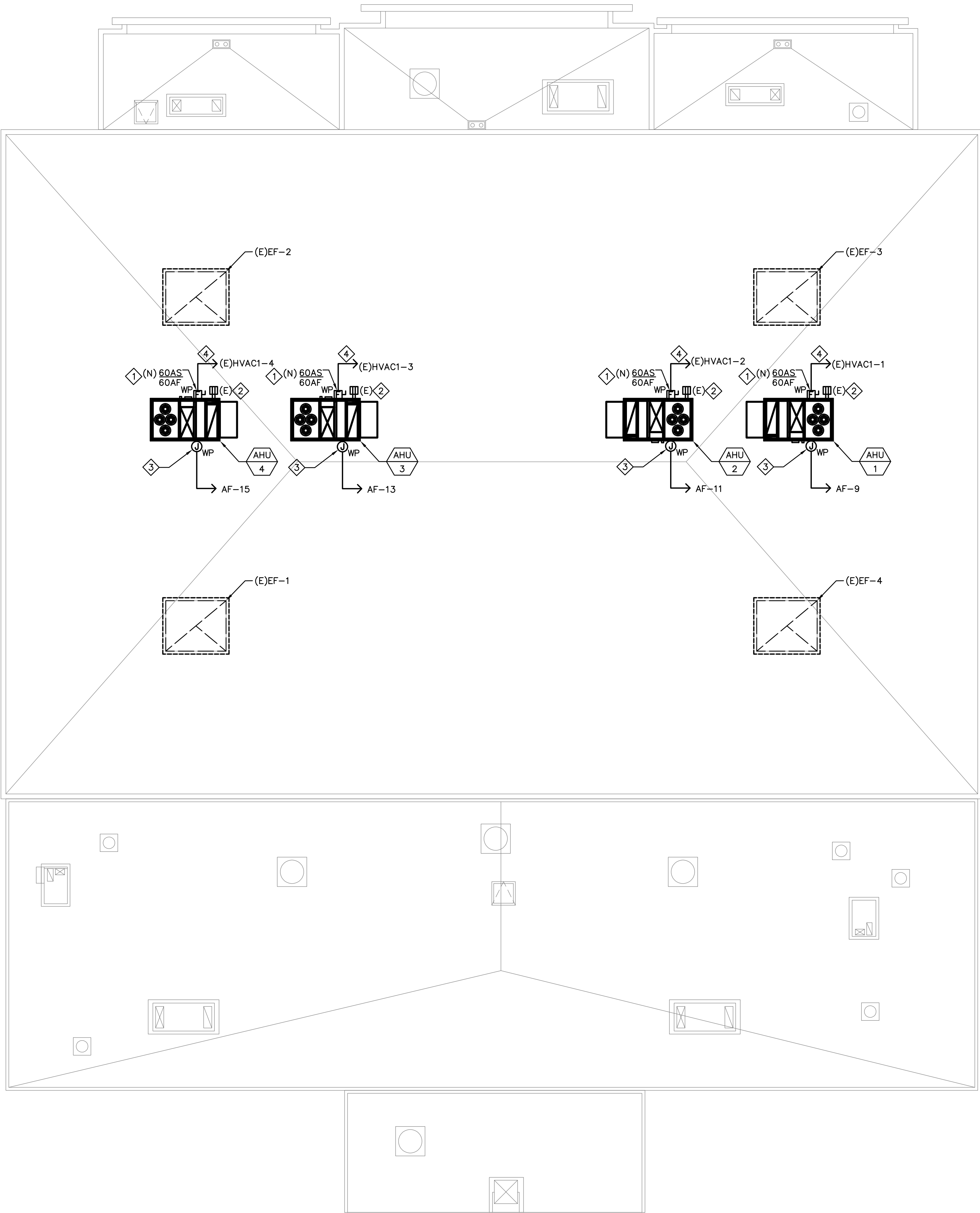
DRAWING TITLE:

ELECTRICAL
DEMO
ROOF PLAN

DRAWING NO.:

E2.2

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GENERAL NOTES

1. OPENING AROUND ELECTRICAL PENETRATION THROUGH FIRE RESISTANCE RATED WALL, PARTITIONS, FLOORS, OR CEILINGS SHALL BE FIRE STOPPED USING APPROVED METHODS TO MAINTAIN FIRE RESISTANCE RATING.
2. CONTRACTOR SHALL FURNISH AND INSTALL EXPANSION FITTINGS AT ALL EXPANSION JOINTS.
3. CONTRACTOR TO FIELD VERIFY AND COORDINATE WITH OWNER EXACT CONDUIT ROUTING PRIOR TO START OF ANY WORK.
4. REFER TO MECHANICAL PLANS FOR THE EXACT LOCATION OF ALL HVAC1 EQUIPMENT.

REMODEL KEY NOTES

- 1 PROVIDE NEW NON FUSED DISCONNECT SWITCH, EXTEND CONDUIT AND WIRING AS REQUIRED TO NEW DISCONNECT LOCATION.
- 2 EXISTING RECEPTACLE. EXTEND CONDUIT AND WIRING AS REQUIRED.
- 3 PROVIDE A 24V TRANSFORMER AND 120V CONTROLS FOR ALL AHU'S.
- 4 REFER TO SHEET E0.3 -- SINGLE LINE DIAGRAM FOR FEEDER SIZES AND POWER REQUIREMENTS FOR AHU'S.

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PROJECT:
SAN DIMAS HS GYM

JOB NUMBER: 12.03.01
DATE: 2022-01-14

REVISION: **DATE:** _____
REVISION: **DATE:** _____

DRAWING TITLE:
ELECTRICAL REMODEL ROOF PLAN

DRAWING NO.:

E2.3



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	NOT TO SCALE	7	CONDUIT SUPPORT ON ROOF DETAIL	NOT TO SCALE	4	A/C DISCONNECT MOUNTING DETAIL	NOT TO SCALE	1	
CONDUIT PENETRATION THRU 1-HOUR FIRE/SMOKE WALL DETAIL		NOT TO SCALE	5	CONDUIT ROOF PENETRATION DETAIL		NOT TO SCALE	2		
CONDUIT PENETRATION THRU 2-HOUR CONCRETE FLOOR/WALL DETAIL		NOT TO SCALE	6	GROUND BUS MOUNTING DETAIL		NOT TO SCALE	3		

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



JOB NUMBER: 12.03.01
DATE: 2022-01-14

REVISION: DATE: _____
REVISION: DATE: _____

DRAWING TITLE:
ELECTRICAL
DETAILS

DRAWING NO.:

E3.1

FIRE ALARM SYMBOL LIST					
SYMBOL	MFG.	PART NO.	DESCRIPTION	MNTG. HEIGHT/ DETAILS	CSFM LISTING NO.
(E) 	NOTIFIER	NFS-320	(E) FIRE ALARM CONTROL PANEL		EXISTING
(E) 	NOTIFIER	DNR	(E) INTELLIGENT PHOTOELECTRIC DUCT DETECTOR		EXISTING
(E) 	NOTIFIER	FSP-851 B710LP	(E) INTELLIGENT PHOTOELECTRIC SMOKE DETECTORS WITH INTELLIGENT BASES.		7272-0028.0206 7300-0028.0173
(E)&(N) 	NOTIFIER	FRM-1	INTELLIGENT ADDRESSABLE RELAY MODULE	MOUNTED DIRECTLY INTO A 4" SQUARE DEEP ELECTRICAL BOX	7300-0028.0219
(E)&(N) 	AIR PRODUCTS AND CONTROLS	PAM-1	MULTI VOLTAGE RELAY MODULES	MOUNTED DIRECTLY INTO A 5" SQUARE DEEP ELECTRICAL BOX	7300-1004.0101

SEQUENCE OF OPERATION							
ACTION \ DEVICE	MANUAL PULL STATION	AREA SMOKE DETECTOR	AREA/ATTIC HEAT DETECTOR	SPRINKLER WATER FLOW SWITCH	SPRINKLER VALVE TAMPER SWITCH	SPRINKLER POST INDICATOR SWITCH	120VAC POWER FAILURE
ANNUNCIATE AT FACP AND REMOTE ANNUNCIATOR (ALARM OR TROUBLE)	×	×	×	×	×	×	×
ANNUNCIATE RELAY FOR MONITORING (ALARM OR TROUBLE)	×	×	×	×	×	×	×
ACTIVATE AUDIBLE/VISUAL ALARM SIGNAL THROUGHOUT SCHOOL (ALARM)	×	×	×	×			
SOUND SPRINKLER BELL				×			
SHUT DOWN ALL AIR HANDLING (HVAC) UNITS THROUGHOUT BUILDING		×	×				

NOTE:
REFER TO REFERENCED DSA APPROVED DRAWINGS A#03-113218 FOR THE EXISTING RISER DIAGRAM AND THE EXISTING BATTERY CALCULATIONS. NO NEW LOAD IS ADDED TO THE EXISTING CIRCUITS.

DSA NOTES, STANDARDS AND GUIDES

- ALL WIRING SHALL BE INSTALLED IN ACCORDANCE WITH C.E.C. ARTICLE 760, POWER LIMITED FIRE PROTECTIVE SIGNALING CIRCUITS.
- FIRE ALARM DEVICES SHALL BE INSTALLED PER N.F.P.A. 72, 2016 EDITION.
- FIRE ALARM SYSTEM SHALL BE CONNECTED TO DEDICATED POWER SUPPLY WITH CIRCUIT BREAKER WITH LOCK-ON DEVICE AND SHALL INCORPORATE INTERNAL RECHARGEABLE BATTERIES TO PROVIDE A STAND-BY OPERATION (100% OF APPLICABLE COMPONENTS FOR 24 HOURS) AND ALARM OPERATION (100% OF APPLICABLE COMPONENTS FOR 5 MINUTES; 15 MINUTES FOR EVAC) AFTER 24 HOURS OF STAND-BY OPERATION IN ACCORDANCE WITH N.F.P.A. CHAPTER 10, 2016 EDITION.
- ALL WIRING, ANNUNCIATING DEVICES AND ANNUNCIATOR PANEL SHALL BE SUPERVISED AT THE PRINCIPAL POINT OF ANNUNCIATION. (FIA PANEL TO SUPERVISE ALL CIRCUITS AND INITIATING DEVICES)
- POINT AND COMMON ANNUNCIATION AND T-TAPPING IS PROHIBITED.
- PROVIDE ALL NECESSARY BACK BOXES FOR FIA DEVICES, TYPE 45 OR AS REQUIRED.
- VERTICAL RUNS OF FIRE ALARM SYSTEM CONDUCTORS AND CABLES SHALL BE ENCLOSED IN METAL RACEWAYS.
- UPON COMPLETION OF THE INSTALLATION OF THE FIRE ALARM SYSTEM, A SATISFACTORY TEST OF THE ENTIRE SYSTEM SHALL BE MADE IN THE PRESENCE OF THE DSA-CERTIFIED PROJECT INSPECTOR.
- A STAMPED SET OF APPROVED FIRE ALARM PLANS SHALL BE ON THE JOB SITE AND USED FOR INSTALLATION.
- ANY DEVIATION FROM APPROVED PLANS, INCLUDING THE SUBMITTAL OF DEVICES, SHALL BE APPROVED BY THE DSA.
- ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE CODE OF RECOGNIZED STANDARDS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
- ALL DEVICES ON THE FIRE ALARM SYSTEM SHALL BE APPROVED AND LISTED BY THE CALIFORNIA STATE FIRE MARSHAL.
- CERTIFICATE OF COMPLIANCE SHALL BE SUBMITTED TO THE DSA. AN ACCEPTABLE TEST WITNESSED BY THE DSA SHALL BE PERFORMED PRIOR TO FINAL APPROVAL PER NFPA 72 2016 CHAPTER 14.4.1.1 TESTING.
- ALL CONDUCTORS SHALL BE POWER LIMITED COPPER AND INSTALLED WITHIN A METALLIC RACEWAY. CONDUITS SHALL BE A MINIMUM SIZE OF 3/4".
- SEAL ALL CONDUIT PENETRATIONS THROUGH THE FIRE RATED WALLS AND FLOORS WITH APPROVED SAME RATING FIRE RATED CAULK.
- PROVIDE SUPPORT FOR ALL CONDUITS AND VERTICAL WIRING AS REQUIRED BY N.E.C.
- REFER TO FIRE ALARM SPECS FOR MANUFACTURERS CUT SHEETS AND CALIFORNIA STATE FIRE MARSHAL LISTINGS.
- UPON COMPLETION OF THE INSTALLATION A SATISFACTORY TEST OF THE ENTIRE SYSTEM SHALL BE MADE IN THE PRESENCE OF THE ENFORCING AGENCY.
- THE FIRE ALARM SYSTEM SHALL CONFORM TO THE C.E.C. ARTICLE 760, DEVICES SHALL BE INSTALLED PER 2016 NFPA 72. PROVIDE ALL WIRING BY THE ELECTRICAL CONTRACTOR.
- WIRING SHALL NOT BE LOOPED THROUGH DEVICES; WIRE MUST BE CUT FOR IN AND OUT.
- ALL DEVICES IN THE ALARM SYSTEM SHALL BE COMPATIBLE AND INSTALLED TO MANUFACTURERS SPECIFICATIONS.
- AREAS HAVING MORE THAN 2 STROBES IN THE FIELD OF VIEW SHALL BE SYNCHRONIZED.
- SMOKE DETECTORS AND HEAT DETECTOR LOCATIONS ARE BASED ON SMOOTH CEILING WITH MAXIMUM HEIGHT OF 10 FEET UNLESS OTHERWISE NOTED.
- STROBE LOCATION IS BASED ON 10 FOOT CEILING HEIGHT AND ARE INSTALLED ACCORDING TO NFPA 72, 2016 EDITION REQUIREMENTS UNLESS OTHERWISE NOTED.
- WALL-MOUNTED STROBES SHALL HAVE THEIR BOTTOM LENS NOT LESS THAN 80 INCHES ABOVE FINISHED FLOOR AND NO GREATER THAN 96 INCHES TO THE TOP OF THE LENS ABOVE FINISHED FLOOR.
- TOP OF PULL STATIONS SHALL BE MOUNTED AT 48" ABOVE FLOOR LEVEL.
- ALL FIRE ALARM DEVICES ON THE CAMPUS SHALL BE SYNCHRONIZED.
- ALL FIRE ALARM CIRCUITS SHALL BE LABELED AT CONNECTIONS AND AT JUNCTION BOXES. ALL CONCEALED CONDUIT, JUNCTION BOXES AND COVERS SHALL BE RED IN COLOR. ALL CONDUIT SHALL BE CONCEALED WHERE POSSIBLE. ALL EXPOSED CONDUITS SHALL NOT BE RED AND SHALL BE WIREMOLD 700 OR EQUAL.
- FIRE ALARM DRAWINGS ARE SCHEMATIC IN NATURE ONLY. CONTRACTOR TO ROUTE CONDUIT AS FIELD CONDITIONS INDICATE.
- CONDUIT AND JUNCTION/BACK BOXES ARE NOT TO BE USED FOR UNRELATED WIRING. ALL WIRING SHALL BE IN CONDUIT. ALL CONDUIT SIZES INDICATED IN DRAWINGS ARE MINIMUM.
- FIRE ALARM SYSTEM SHALL BE INSTALLED BY FACTORY NOTIFIER OR APPROVED EQUAL AUTHORIZED REPRESENTATIVE.
- PER CFC 901.5.1: OCCUPANCY TO ANY PORTION OF BUILDING/STRUCTURE PROHIBITED UNTIL THE REQUIRED SYSTEM IS INSTALL AND CERTIFIED.
- PER CFC 907.8.4: SMOKE DETECTOR(S) SHALL BE TESTED BY MANUFACTURER'S CALIBRATED SENSITIVITY TEST METHOD. SENSITIVITY TEST INSTRUMENT OR OTHER CALIBRATED SENSITIVITY TEST METHOD. SENSITIVITY REPORT SHALL REMAIN ON PREMISE WITH RECORD DRAWING.
- VISIBLE DEVICES SHOULD NOT EXCEED TWO FLASHES PER SECOND AND SHOULD NOT BE SLOWER THAN ONE FLASH EVERY SECOND. THE DEVICE SHALL HAVE A PULSING LIGHT SOURCE NOT LESS THAN 15 CANDELLA. VISIBLE DEVICES WITHIN 55' FROM EACH OTHER SHALL BE SYNCHRONIZED.
- CHANGES TO THE APPROVED DRAWINGS AND SPECIFICATIONS SHALL BE MADE BY ADDENDA OR CHANGE ORDERS APPROVED BY THE DIVISION OF THE STATE ARCHITECT, AS REQUIRED BY SECTION 4-338, PART 1, TITLE 24, CCR.
- A "DSA CERTIFIED" PROJECT INSPECTOR EMPLOYED BY THE DISTRICT (OWNER) AND APPROVED BY THE DIVISION OF THE STATE ARCHITECT SHALL PROVIDE CONTINUOUS INSPECTION OF THE WORK. THE DUTIES OF THE INSPECTOR ARE DEFINED IN SECTION 4-342, CALIFORNIA BUILDING STANDARD ADMINISTRATIVE CODE (PART 1, TITLE 24, CCR).
- A DSA INSPECTOR WITH CLASS 2 - RBIP CERTIFICATION IS REQUIRED FOR THIS PROJECT.
- THE INTENT OF THESE DRAWINGS AND SPECIFICATIONS IS THAT THE WORK OF THE ALTERATION, REHABILITATION OR RECONSTRUCTION IS TO BE IN ACCORDANCE WITH TITLE 24, CALIFORNIA CODE OF REGULATIONS. SHOULD ANY EXISTING CONDITIONS SUCH AS DETERIORATION OR NON-COMPLYING CONSTRUCTION BE DISCOVERED WHICH IS NOT COVERED BY THE CONTRACT DOCUMENTS WHEREIN THE FINISHED WORK WILL NOT COMPLY WITH TITLE 24, CALIFORNIA CODE OF REGULATIONS, A CHANGE ORDER, OR A SEPARATE SET OF PLANS AND SPECIFICATION, DETAILING AND SPECIFYING THE REQUIRED WORK SHALL BE SUBMITTED TO AND APPROVED BY THE DIVISION OF THE STATE ARCHITECT BEFORE PROCEEDING WITH THE WORK. (REFERENCE: SECTION 4-317 (c), CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE (PART 1, TITLE 24, CCR))
- AUTOMATIC FIRE ALARM SYSTEMS SHALL TRANSMIT THE ALARM, SUPERVISORY AND TROUBLE SIGNALS TO AN APPROVED SUPERVISING STATION AS REQUIRED BY NFPA 72 AS AMENDED BY ARTICLE 91. THE SUPERVISION STATION SHOULD BE LISTED AS EITHER UJFX OR UJUS BY UNDERWRITERS LABORATORY OR SHALL MEET THE REQUIREMENTS OF FACTORY MUTUAL RESEARCH APPROVAL STANDARD 3011. SUPERVISION OF SYSTEM AND LEASED TELEPHONE LINES SHALL BE ARRANGED BY OWNER.
- PROJECT INSPECTOR SHALL PROVIDE DSA DISTRICT FIELD ENGINEER, OWNER (AOR) & LOCAL FIRE AUTHORITY WITH COPY OF FIRE ALARM RECORD OF COMPLETION.
- AUDIBLE APPLIANCES SHALL PROVIDE 15 dba. ABOVE AMBIENT NOISE LEVELS IN ALL OCCUPIED AREAS.
- CUTTING, BORING, SAW CUTTING, OR DRILLING THROUGH THE NEW OR EXISTING STRUCTURAL ELEMENTS TO BE DONE ONLY WHEN SO DETAILED IN THE DRAWINGS OR ACCEPTED BY THE LAUSD ARCHITECT AND STRUCTURAL ENGINEER WITH DAS APPROVAL
- AN INSPECTOR WHO IS SPECIFICALLY QUALIFIED IN MECHANICAL & ELECTRICAL WORK WILL BE REQUIRED FOR THIS PROJECT.
- CUTTING, BORING, SAW CUTTING, OR DRILLING THROUGH THE NEW OR EXISTING STRUCTURAL MEMBERS ARE TO BE DONE ONLY WHEN SO DETAILED IN THE DRAWINGS, OR ACCEPTED BY THE ARCHITECT AND STRUCTURAL ENGINEER WITH APPROVAL OF DSA.

SHEET INDEX

SHT.NO.	DESCRIPTION
EF0.1	GENERAL NOTES, APPLICABLE CODES AND SHEET INDEX
EF2.1	FIRE ALARM REMODEL PLAN
EF3.1	FIRE ALARM DETAILS

FIRE ALARM WORK SCOPE

THE CONTRACTOR IS TO ACCOMPLISH THE FOLLOWING :

- DISCONNECT AND REMOVE EXISTING DUCT DETECTORS.
- PROVIDE FIRE ALARM CONNECTIONS FOR NEW HVAC UNITS SHUTDOWN.
- RE-PROGRAM AND RE-TEST THE (E) FIRE ALARM CONTROL PANEL AND ALL AFFECTED CIRCUITS. UPDATE THE GRAPHIC ANNUNCIATOR TO ACCEPT THE NEW BUILDING.

CONTRACTOR SUBMITTAL REQUIREMENT

FIRE ALARM SYSTEM

- EVIDENCE OF QUALIFICATION FOR SYSTEM INSTALLER. CERTIFICATE FROM FIRE ALARM SYSTEM MANUFACTURER INDICATING THE COMPANY IS FACTORY AUTHORIZED AND CERTIFIED TO INSTALL THE FIRE ALARM SYSTEM AS SPECIFIED ON DRAWINGS.
- SITE PLAN SHOWING CONDUIT AND WIRING BETWEEN BUILDINGS.
- FLOOR PLANS SHOWING DEVICES AND WIRING.
- DRAWINGS SHOWING a) RISER DIAGRAM, b) BATTERY AND VOLTAGE DROP CALCULATIONS, c) TYPICAL DEVICE WIRING DIAGRAMS, d) EQUIPMENT AND WIRING LEGEND, e) APPLICABLE CODES REFERENCE f) SEQUENCE OF OPERATION.
- EQUIPMENT CUT SHEETS WITH CSFM LISTING SHEETS.
- GENERAL NOTES.

ALL OTHER LOW VOLTAGE SYSTEMS

- EVIDENCE OF QUALIFICATION FOR SYSTEM INSTALLER.
- SITE PLAN SHOWING CONDUIT AND WIRING BETWEEN BUILDINGS.
- FLOOR PLANS SHOWING DEVICES AND WIRING.
- DRAWINGS SHOWING a) RISER DIAGRAM/BLOCK DIAGRAMS, b) TYPICAL DEVICES WIRING DIAGRAMS, c) MAJOR EQUIPMENT ELEVATION, d) EQUIPMENT AND WIRING LEGEND, e) CALCULATION (IF REQUIRED).
- EQUIPMENT CUT SHEETS WITH CLEAR IDENTIFICATION.
- BILL OF MATERIALS.
- GENERAL NOTES.

GENERAL NOTES

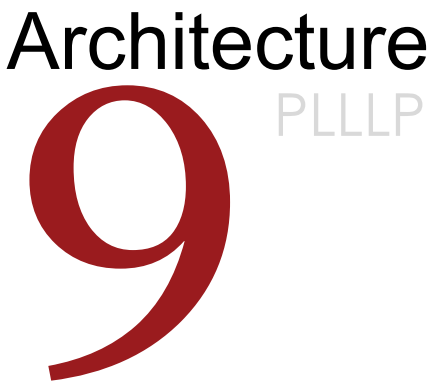
- SITE PLAN, FLOOR PLANS, RISER DIAGRAMS, WIRING DIAGRAMS, CALCULATIONS MUST BE SUBMITTED IN AUTO CAD FORMAT. THE CONTRACTOR SHALL COMPLY WITH OWNER'S LABELING FORMAT AND STANDARDS.
- AFTER COMPLETION OF THE PROJECT, THE CONTRACTOR MUST SUBMIT (4) FOUR COPIES OF "AS-BUILT" CONSTRUCTION DRAWINGS WITH PROJECT CLOSING DOCUMENTS INCLUDING TEST REPORT AS REQUIRED PER SPECIFICATION.
- REFER TO ADDITIONAL REQUIREMENT IN RESPECTIVE SYSTEM SPECIFICATION.

**COMPLETE FIRE ALARM SYSTEM
APPROVAL REQUESTED SUBMITTAL
PER DSA GL 2**

CONDUIT AND WIRE SPECIFICATIONS

LABEL	DESCRIPTION OF CONTENTS	CONDUIT SIZE (UNO)
F1 F2	(1)-2#16 THHN/THWN STRANDED (1)-2#14 THHN/THWN STRANDED	3/4" MIN. 3/4" MIN.

- NOTES:
- 2/16 = WESTPENN CABLE #990; INSIDE ONLY.
 - 2/16 = ALLSTAR CABLE #3216B2-S1-0; UNDERGROUND.
 - #12 = GENERAL CABLE; 12AWG THWN STRANDED
 - #16 = GENERAL CABLE; 16AWG THHN STRANDED
 - "THWN" "AQUASEAL", OR EQUAL TO BE USED IN WET LOCATIONS.
 - ALL WIRING TO BE LISTED FOR USE AS REQUIRED BY TITLE 24/CEC, ART. 760.
 - WHERE CONDUIT IS INSTALLED, CONDUIT FILL SHALL COMPLY WITH 2019 NEC FILL TABLE C.1 (BASED ON TABLE 1, CHAPTER 9).



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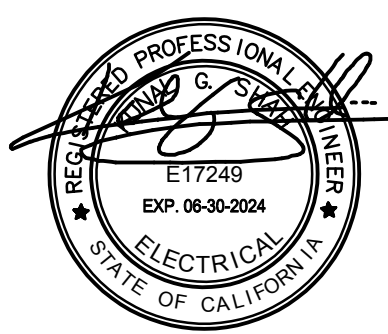


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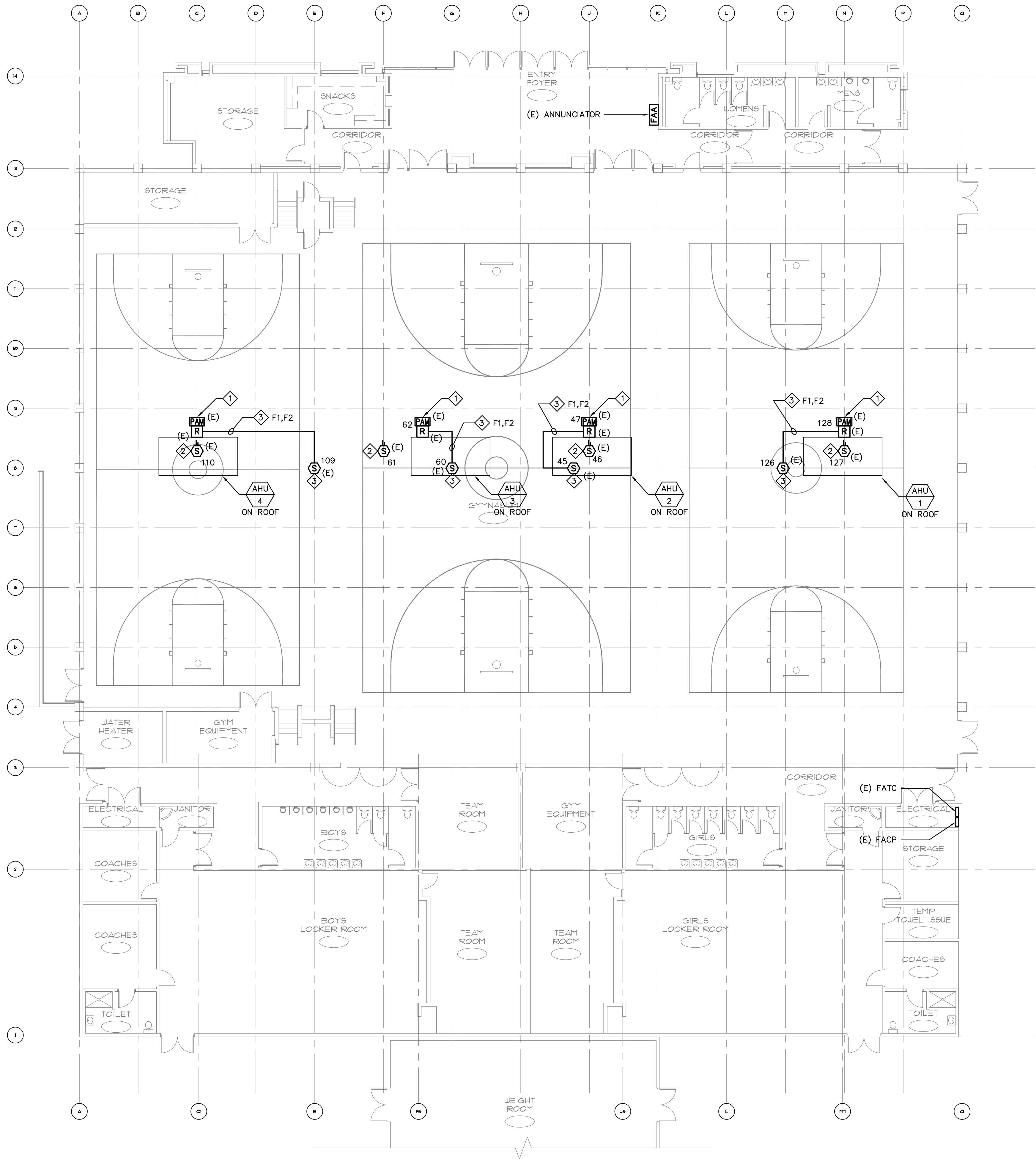
DRAWING TITLE:

**GENERAL NOTES,
APPLICABLE CODES
& SHEET INDEX**

DRAWING NO.:

EF0.1

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GENERAL NOTES

1. REFER TO DSA APPROVED DRAWINGS A#03-113218 FOR EXISTING FIRE ALARM RISER.

2. ALL FIRE ALARM SYSTEM DEVICES SHALL BE U.L. AND C.S.F.M. LISTED AND APPROVED.

3. ROUTE CONDUITS CONCEALED WHEREVER POSSIBLE. ROUTE EXPOSED CONDUITS HIGH AND TIGHT TO STRUCTURE AND ROOF DECK. REFER TO SHEET 3.1 FOR CONDUIT SUPPORT AND PENETRATION DETAIL.

4. ALL WIRING SHALL BE IN CONDUIT AND PROVIDE MINIMUM 3/4 INCH CONDUIT.

REMODEL KEY NOTES

1. REPLACE EXISTING INTELLIGENT ADDRESSABLE RELAY MODULE (FRM-1) WITH MULTI VOLT RELAY MODULE (PAM-1) WITH NEW AND CONNECT TO NEW HVAC UNIT CONTROLLER FOR AUTOMATIC SHUTOFF PER CMC 608. SEE DETAIL 3/EF3.1. PROVIDE FIRE ALARM CONNECTION FROM EXISTING ADDRESSABLE DUCT DETECTOR.

2. EXISTING DUCT DETECTOR MODEL#DNR NEED TO BE REMOVED.

3. EXISTING AREA SMOKE DETECTOR MODEL#FSP-851. EXTEND CONDUIT TO NEW RELAY MODULES AND PROVIDE NEW FA SYSTEM WIRING FOR AIR HANDLING UNIT SHUT DOWN UPON ALARM.

SCALE: 3/32"=1'-0"

1

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JOB NUMBER: 12.03.01
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REVISION:

1

 DATE:

REVISION:

2

 DATE:

DRAWING TITLE:

FIRE ALARM
REMODEL PLAN

DRAWING NO.:

EF2.1

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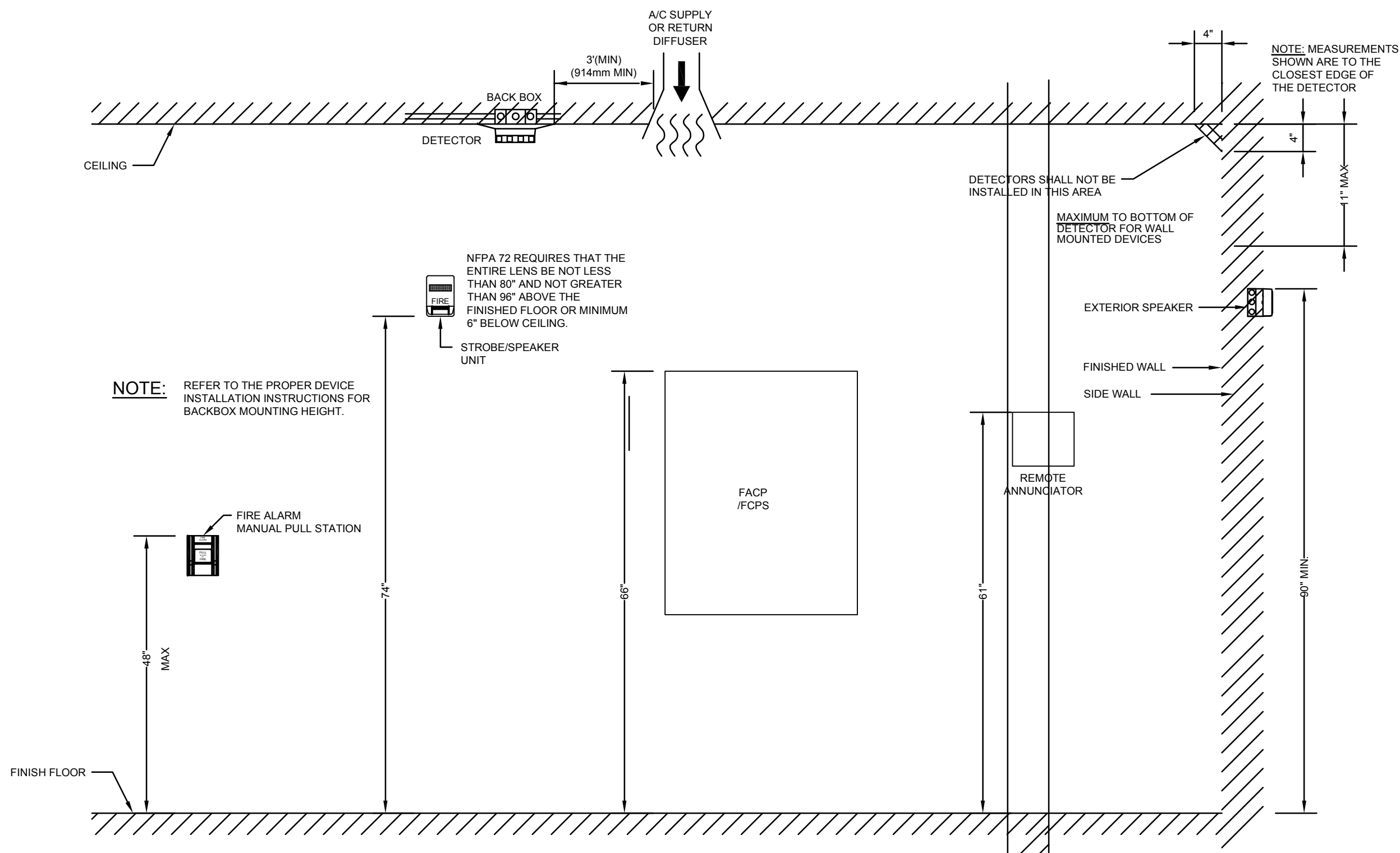
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TYPICAL FACP/FCPS INTERFACING WIRING DIAGRAM

NOT TO SCALE 4

RELAY MODULE WIRING DIAGRAM

NOT TO SCALE 1

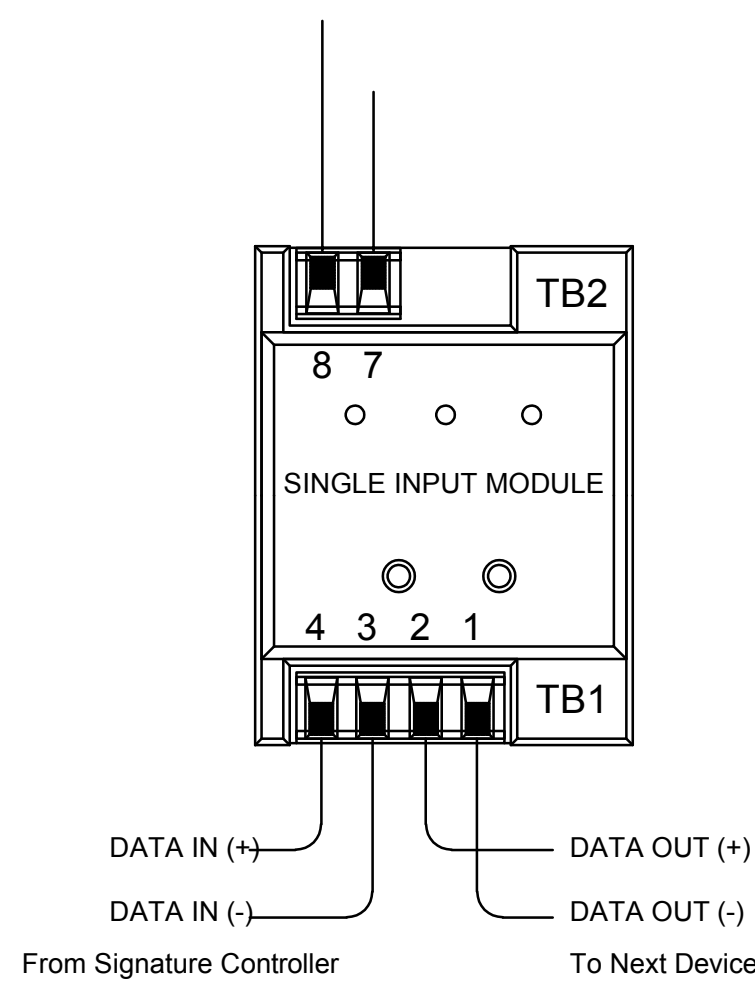
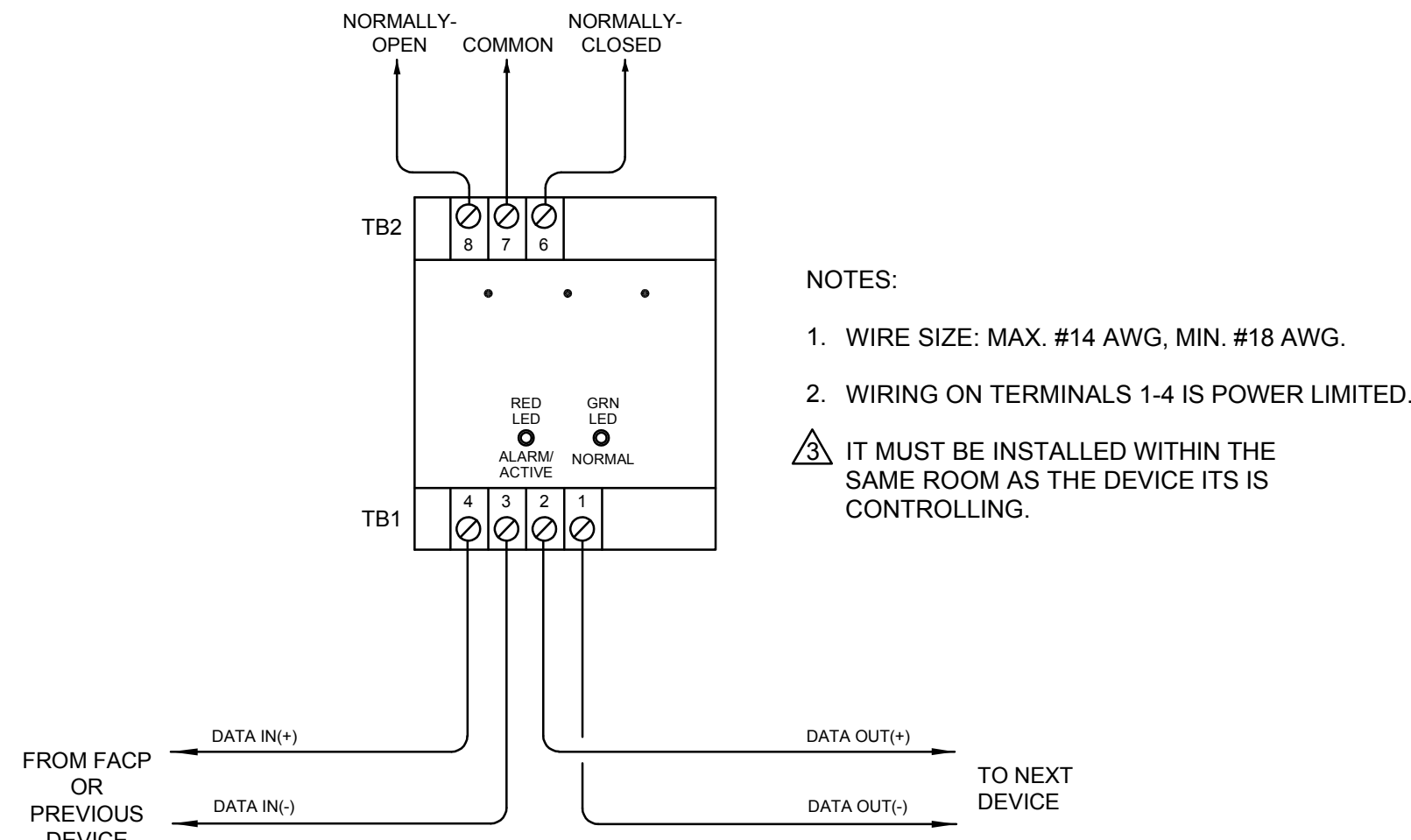
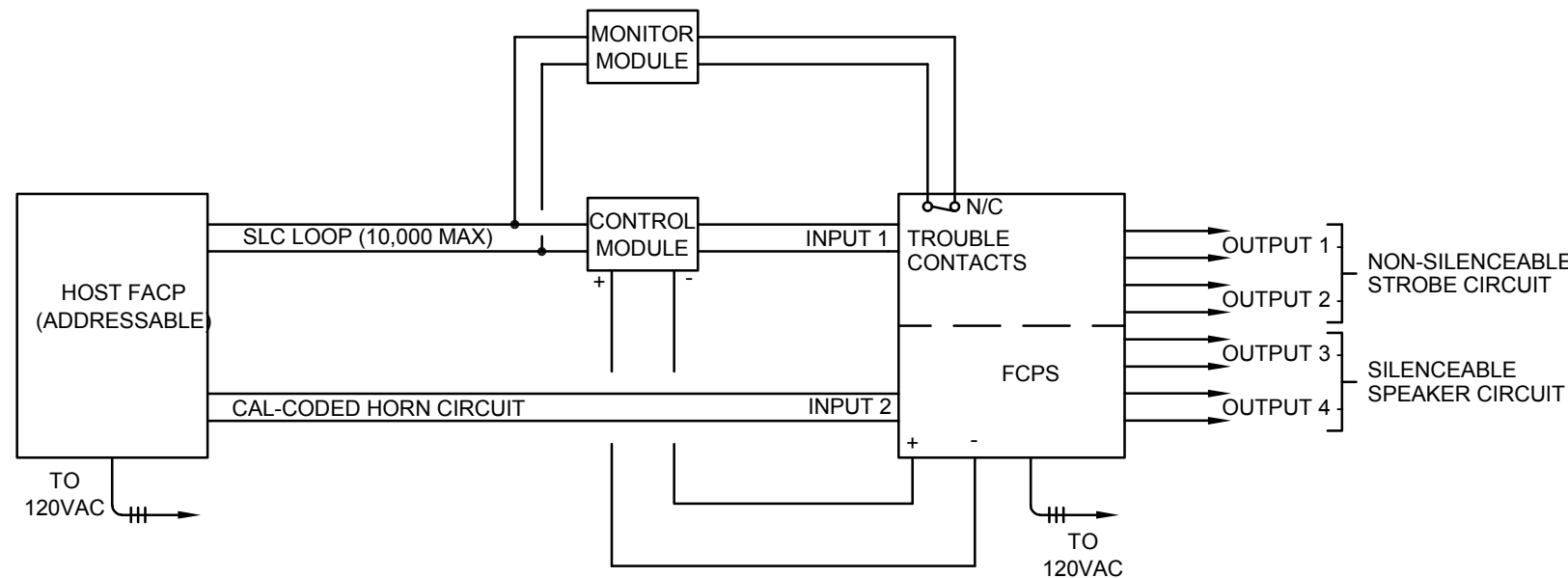


FIRE ALARM EQUIPMENT MOUNTING DETAIL

NOT TO SCALE 5

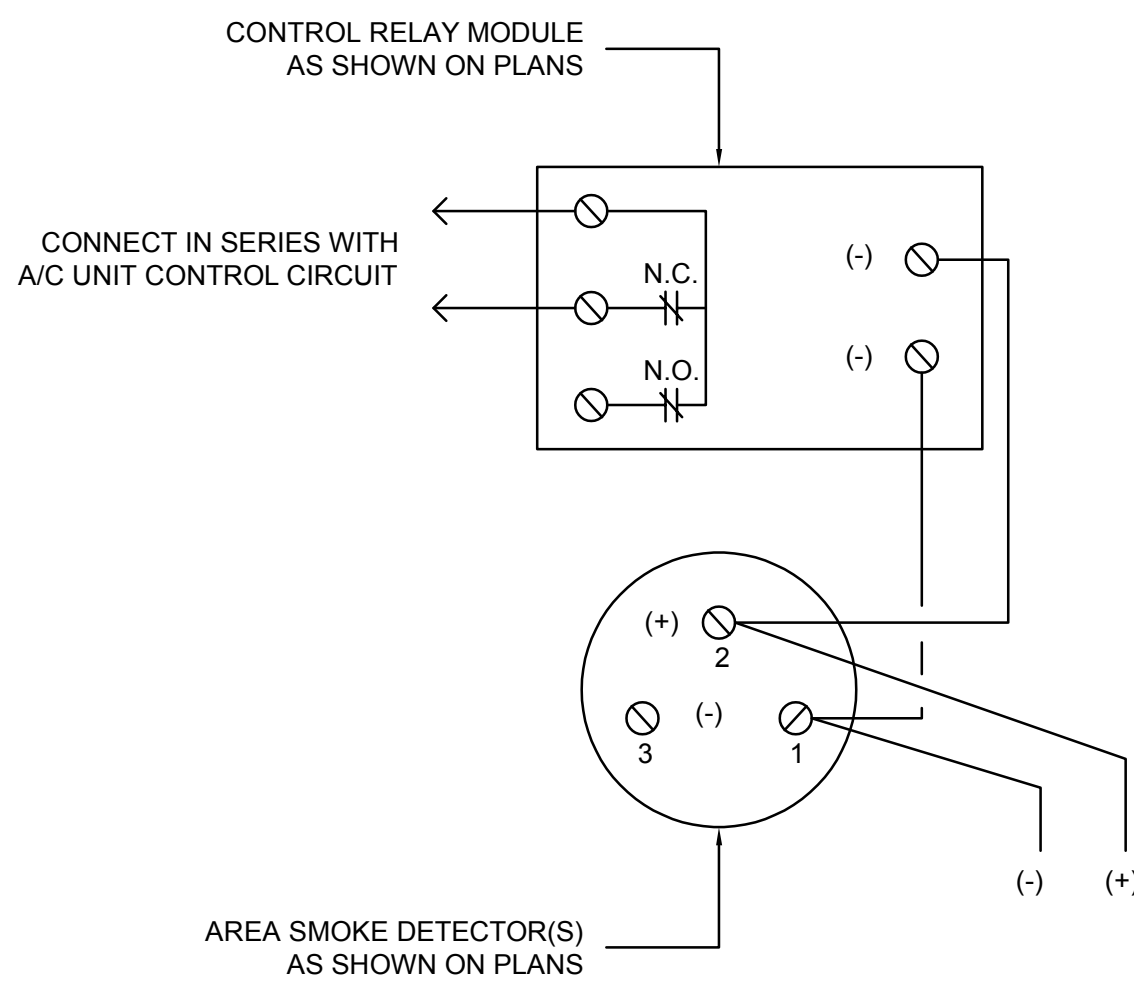
TYPICAL A/C SHUTDOWN CONTROLS

NOT TO SCALE 3



MONITOR MODULE WIRING DIAGRAM

NOT TO SCALE 2



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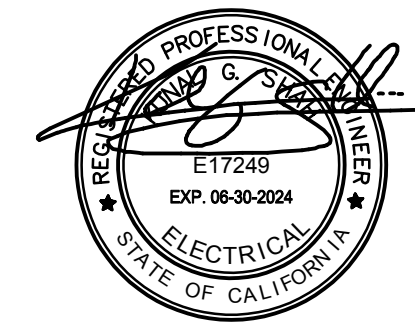
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T. 626.650.0350 F. 626.650.0352
www.pbsengineers.com Job no. 2021-191-00

CONSULTANTS STAMP:



SCHOOL DISTRICT:

**SAN DIMAS
SCHOOL
DISTRICT**

PROJECT:

**SAN DIMAS HS
GYM**

JOB NUMBER: 12.03.01

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

**FIRE ALARM
DETAILS**

DRAWING NO.:

EF3.1

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS, 2019 CBC

Application Number: 03-122101	School Name: SAN DIMAS HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-21 09:12:05

2019 CBC

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A (2019 CBC).

****NOTE:** Undefined section and table references found in this document are from the CBC, or California Building Code.

KEY TO COLUMNS

1. TYPE	2. PERFORMED BY
Continuous – Indicates that a continuous special inspection is required	GE – Indicates that the special inspection shall be performed by a registered geotechnical engineer or his or her authorized representative.
Periodic – Indicates that a periodic special inspection is required	LOR – Indicates that the test or special inspection shall be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See CAC Section 4-335.
Test – Indicates that a test is required	PI – Indicates that the special inspection may be performed by a project inspector when specifically approved by DSA.
	SI – Indicates that the special inspection shall be performed by an appropriately qualified/approved special inspector.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (STEEL AND ALUMINUM), 2019 CBC

1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

Application Number: 03-122101	School Name: SAN DIMAS HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-21 09:12:05

S/A1. STRUCTURAL STEEL, COLD-FORMED STEEL AND ALUMINUM USED FOR STRUCTURAL PURPOSES				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify identification of all materials and: • Mill certificates indicate material properties that comply with requirements. • Material sizes, types and grades comply with requirements.	Periodic	*	Table 1705A.2.1 Item 3a 3c. 2202A.1; AISI S100-16 Section A3.1 & A3.2, AISI S240-15 Section A3 & A5, AISI S220-15 Sections A4 & A6. * By special inspector or qualified technician when performed off-site.
<input checked="" type="checkbox"/>	b. Test unidentified materials	Test	LOR	2202A.1.
<input checked="" type="checkbox"/>	c. Examine seam welds of HSS shapes	Periodic	SI	DSA IR 17-3.
<input checked="" type="checkbox"/>	d. Verify and document steel fabrication per DSA-approved construction documents.	Periodic	SI	Not applicable to cold-formed steel light-frame construction, except for trusses (1705A.2.4).
<input type="checkbox"/>	e. Buckling restrained braces.	Test	LOR	Testing and special inspections in accordance with IR 22-4.

S/A2. HIGH-STRENGTH BOLTS:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the DSA-approved documents.	Periodic	SI	Table 1705A.2.1 Items 1a & 1b, 2202A.1; AISC 360-16 Section A3.3, J3.1, and N3.2; RCSC 2014 Section 1.5 & 2.1; DSA IR 17-8 & DSA IR 17-9.
<input checked="" type="checkbox"/>	b. Test high-strength bolts, nuts and washers.	Test	LOR	Table 1705A.2.1 Item 1c, 2213A.1; RCSC 2014 Section 7.2; DSA IR 17-8.
<input type="checkbox"/>	c. Bearing-type ("snug tight") connections.	Periodic	SI	Table 1705A.2.1 Item 2a, 1705A.2.6, 2204A.2; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Section 9.1; DSA IR 17-9.
<input checked="" type="checkbox"/>	d. Pretensioned and slip-critical connections.	*	SI	Table 1705A.2.1 Items 2b & 2c, 1705A.2.6, 2204A.2; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Sections 9.2 & 9.3; DSA IR 17-9. * "Continuous" or "Periodic" depends on the tightening method used.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (STEEL AND ALUMINUM), 2019 CBC

1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

Application Number:

03-122101

School Name:

SAN DIMAS HIGH SCHOOL

School District:

BONITA UNIFIED SCHOOL DISTRICT

DSA File Number:

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Date Created:

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S/A3. WELDING:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify weld filler material identification markings per AWS designation listed on the DSA-approved documents and the WPS.	Periodic	SI	1705A.2.5, Table 1705A.2.1 Items 4 & 5; AWS D1.1 and AWS D1.8 for structural steel; AWS D1.2 for Aluminum; AWS D1.3 for cold-formed steel; AWS D1.4 for reinforcing steel; DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Verify weld filler material manufacturer's certificate of compliance.	Periodic	SI	DSA IR 17-3.
<input checked="" type="checkbox"/>	c. Verify WPS, welder qualifications and equipment.	Periodic	SI	DSA IR 17-3.

S/A4. SHOP WELDING (IN ADDITION TO SECTION S/A3):				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	Continuous	SI	Table 1705A.2.1 Items 5a.1 4; AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds.	Periodic	SI	1705A.2.2, Table 1705A.2.1 Items 5a.5 & 5a.6; AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	c. Inspect welding of stairs and railing systems.	Periodic	SI	1705A.2.1; AISC 360-16 (and AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3.
<input type="checkbox"/>	d. Verification of reinforcing steel weldability other than ASTM A706.	Periodic	SI	1705A.3.1; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
<input type="checkbox"/>	e. Inspect welding of reinforcing steel.	Continuous	SI	Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8; AWS D1.4; DSA IR 17-3.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (STEEL AND ALUMNINUM), 2019 CBC

1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

Application Number:

03-122101

School Name:

SAN DIMAS HIGH SCHOOL

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	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A5. FIELD WELDING (IN ADDITION TO SECTION S/A3):			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	Continuous	SI	Table 1705A.2.1 Items 5a.1 4; AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Inspect single-pass fillet welds ≤ 5/16".	Periodic	SI	Table 1705A.2.1 Item 5a.5; AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	c. Inspect end-welded studs (ASTM A-108) installation (including bend test).	Periodic	SI	2213A.2; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1; DSA IR 17-3.
<input checked="" type="checkbox"/>	d. Inspect floor and roof deck welds.	Periodic	SI	1705A.2.2, Table 1705A.2.1 Item 5a.6; AISC 360-16 (AISC 341-16 as applicable); AWS D1.3; DSA IR 17-3.
<input type="checkbox"/>	e. Inspect welding of structural cold-formed steel.	Periodic	SI*	1705A.2.5; AWS D1.3; DSA IR 17-3. The quality control provisions of AISI S240-15 Chapter D shall also apply. * May be performed by the project inspector when specifically approved by DSA.
<input type="checkbox"/>	f. Inspect welding of stairs and railing systems.	Periodic	SI*	1705A.2.1; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3. * May be performed by the project inspector when specifically approved by DSA.
<input type="checkbox"/>	g. Verification of reinforcing steel weldability.	Periodic	SI	1705A.3.1; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
<input type="checkbox"/>	h. Inspect welding of reinforcing steel.	Continuous	SI	Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8; AWS D1.4; DSA IR 17-3.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (STEEL AND ALUMNINUM), 2019 CBC

1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A6. NONDESTRUCTIVE TESTING:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Ultrasonic	Test	LOR	1705A.2.1, 1705A.2.5; AISC 341-16 J6.2, AISC 360-16 N5.5; ANSI/ASNT CP-189, SNT-TC-1A; AWS D1.1, AWS D1.8; DSA IR 17-2.
<input type="checkbox"/>	b. Magnetic Particle	Test	LOR	1705A.2.1, 1705A.2.5; AISC 341-16 J6.2, AISC 360-16 N5.5; ANSI/ASNT CP-189, SNT-TC-1A; AWS D1.1, AWS D1.8; DSA IR 17-2.
<input type="checkbox"/>	c.	Test	LOR	

	S/A7. STEEL JOISTS AND TRUSSES:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Verify size, type and grade for all chord and web members as well as connectors and weld filler material; verify joist profile, dimensions and camber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist.	Continuous	SI	1705A.2.3, Table 1705A.2.3; AWS D1.1; DSA IR 22-3 for steel joists only. 1705A.2.4; AWS D1.3 for cold-formed steel trusses.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (STEEL AND ALUMNINUM), 2019 CBC

1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A8. SPRAY APPLIED FIRE-PROOFING:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Examine structural steel surface conditions, inspect application, take samples, measure thickness and verify compliance of all aspects of application with DSA-approved documents.	Periodic	SI	1705A.14.
<input type="checkbox"/>	b. Test bond strength.	Test	LOR	1705A.14.6.
<input type="checkbox"/>	c. Test density.	Test	LOR	1705A.14.5.

	S/A9. ANCHOR BOLTS AND ANCHOR RODS:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Anchor Bolts and Anchor Rods	Test	LOR	Sample and test anchor bolts and anchor rods not readily identifiable per procedures noted in DSA IR 17-11.
<input type="checkbox"/>	b. Threaded rod not used for foundation anchorage.	Test	LOR	Sample and test threaded rods not readily identifiable per procedures noted in DSA IR 17-11.

	S/A10. Other Steel			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a.			

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

Application Number: 03-122101	School Name: SAN DIMAS HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-21 09:12:05

Exempt items given in DSA IR A-22 or the 2019 CBC (including DSA amendments) and those items identified below with a check mark by the design professional are NOT subject to DSA requirements for the structural tests / special inspections noted. **Items marked as exempt shall be identified on the approved construction documents.** The project inspector shall verify all construction complies with the approved construction documents.

	SOILS:
<input type="checkbox"/>	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per CBC Table 1806A.2 and having no geotechnical report for the following cases: A) free standing sign or scoreboard, B) cell or antenna towers and poles less than 35'-0" tall (e.g., lighting poles, flag poles, poles supporting open mesh fences, etc.), C) single-story structure with dead load less than 5 psf (e.g., open fabric shade structure), or D) covered walkway structure with an apex height less than 10'-0" above adjacent grade.
<input type="checkbox"/>	2. Shallow foundations, etc. are exempt from special inspections and testing by a Geotechnical Engineer for the following cases: A) buildings without a geotechnical report and meeting the exception item #1 criteria in CBC Section 1803A.2 supported by native soil (any excavation depth) or fill soil (not exceeding 12" depth per CBC Section 1804A.6), B) soil scarification/recompaction not exceeding 12" depth, C) native or fill soil supporting exterior non-structural flatwork (e.g., sidewalks, site concrete ramps, site stairs, parking lots, driveways, etc.), D) unpaved landscaping and playground areas, or E) utility trench backfill.

	CONCRETE/MASONRY:
<input type="checkbox"/>	1. Post-installed anchors for the following: A) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding" in the Appendix below) given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) or B) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
<input type="checkbox"/>	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
<input type="checkbox"/>	3. Non-bearing non-shear masonry walls may be exempt from certain DSA masonry testing and special inspection items as allowed per DSA IR 21-1.16. Refer to construction documents for specific exemptions accordingly for each applicable wall condition.
<input type="checkbox"/>	4. Epoxy shear dowels in site flatwork and/or other non-structural concrete.

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

Application Number: 03-122101	School Name: SAN DIMAS HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
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	CONCRETE/MASONRY:
<input type="checkbox"/>	5. Testing of reinforcing bars is not required for items given in CBC Section 1910A.2 subject to the requirements and limitations in that section.

	WELDING:
<input type="checkbox"/>	1. Solid-clad and open-mesh fences, gates with maximum leaf span of 10', and gates with a maximum rolling section of 10' all having an apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates/fences are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
<input type="checkbox"/>	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds shall not be ground flush.
<input type="checkbox"/>	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
<input type="checkbox"/>	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
<input type="checkbox"/>	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
<input type="checkbox"/>	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for sections S/A3, S/A4 and/or S/A5 located in the Steel/Aluminum category).
<input type="checkbox"/>	7. Any support for exempt non-structural components given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) meeting the following: A) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤4' above supporting floor/roof, B) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS(SIGNATURE), 2019 CBC

Application Number:

03-122101

School Name:

SAN DIMAS HIGH SCHOOL

School District:

BONITA UNIFIED SCHOOL DISTRICT

DSA File Number:

19-H3

Increment Number:

Date Created:

2022-10-21 09:12:05

Name of Architect or Engineer in general responsible charge:

S. MARK GELSINGER

Name of Structural Engineer (When structural design has been delegated):

PETER RAVENKAMP, S.E.

Signature of Architect or Structural Engineer:



Date:

10/21/2022

Note: To facilitate DSA electronic mark-ups and identification stamp application, DSA recommends against using secured electronic or digital signatures.



DSA STAMP

DSA 103-19: LIST OF REQUIRED VERIFIED REPORTS, CBC 2019

Application Number:

03-122101

DSA File Number:

19-H3

School Name:

SAN DIMAS HIGH SCHOOL

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Date Created:

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1. Structural Testing and Inspection: Laboratory Verified Report Form DSA 291

2. Shop Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

3. Field Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

4. High-Strength Bolt Installation Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292



Bonita High School

Gymnasium HVAC Replacement

January 14, 2022

File 19-H3

03-122102

Prepared by Architecture 9 PLLLP



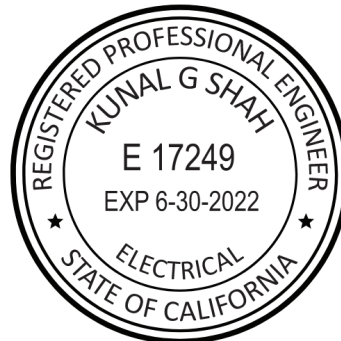
SPECIFICATIONS

Project:	Bonita High School Gymnasium HVAC Replacement
District:	Bonita Unified School District
Architect:	Architecture 9 PLLLP 8816 Foothill Boulevard #103-224 Rancho Cucamonga, California 91730



Steven M. Gelsinger
Architect

C-28546



Kunal Shah, P.E. RCDD, LEED AP
ELECTRICAL ENGINEER

E-17249



Tariq A. Hassan
MECHANICAL ENGINEER

M-33827



Peter R. Ravenkamp
STRUCTURAL ENGINEER

SPECIFICATIONS

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January 14, 2022

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PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Scope of Work.
- B. Work Sequence.
- C. Use of Premises.
- D. Owner Occupancy.
- E. Changes in the Work.

1.02 RELATED REQUIREMENTS

Requirements in General Conditions apply to this Work.

1.03 SCOPE OF WORK (SITE CONTRACTOR)

- A. Work of the Contractor: Perform, within the time stipulated, the contract, including its component parts, and everything required to be performed, and to provide and furnish labor, materials, tools, expendable equipment, and applicable taxes, and utility and transportation services necessary to perform the contract and complete, in a workmanlike matter, the Work required in connection with the following titled Project in strict conformity with the Contract Documents.
- B. Project Scope of Work:
 - 1. **Base Bid:** Work to include but not be limited to Gymnasium bldg. U HVAC replacement, new HVAC enclosure, Toilet Room & Parking lot upgrades.
- C. Time for Completion, Liquidated Damages, Work Sequence:
 - 1. Reference: See General Conditions and Agreement.
 - 2. Time limit(s) for completion of the Work are:
 - a. The Work is to be completed in accordance with the time limit(s) stated in the Agreement.
 - 3. Agreed Liquidated Damages shall be as stated in Agreement.

1.04 WORK SEQUENCE

- A. Work to be continuous from Notice to Proceed to Completion.

1.05 USE OF PREMISES

- A. Contractor shall limit use of premises to allow:
 - 1. Owner occupancy.
 - 2. Public usage.
 - 3. Work by other contractors.

- B. Coordinate use of premises under direction of Owner.
- C. Assume full responsibility for protection and safekeeping of products under this Contract.
- D. Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- E. Noise Control: The Contractor is advised that the District prohibits high noise activities, such as jack-hammering, between the hours of 8:00 AM and 3:00 PM, Monday through Friday, while school is in session. Coordinate with District.

1.06 OWNER OCCUPANCY

Owner will occupy premises during entire construction period for conduct of his normal operations. Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.

1.07 CHANGES IN THE WORK

- A. Changes in the Work shall be done by Addenda or Change Order, only with in accordance with Title 24, Part I, Section 4-338, as follows:
 - 1. General: Work shall be executed in accordance with the approved Drawings, addenda and change orders. Changes in the Drawings and Specifications shall be made by addenda or change orders.
 - 2. Addenda: Changes or alterations of the approved Drawings or Specifications prior to letting a construction contract for the work involved shall be made by means of addenda to contractors. Original copies of addenda shall be manually signed by the Architect or Engineer in general responsible charge of preparation of the Drawings and Specifications and by the Architect or registered Engineer delegated responsibility for the portion affected by the addenda.
 - 3. Change Orders: Changes or alterations of the approved Drawings or Specifications after a Contract for the Work has been let shall be made only by means of change orders prior to commencement of the Work shown thereon. Change orders shall state the reason for the change and the scope of work to be accomplished, and, where necessary, shall be accompanied by supplementary drawings referenced in the text of the change order. All change orders and supplementary drawings shall be manually signed by the Architect or Engineer in general responsible charge of observation of the Work of construction of the Project and by the Architect or registered Engineer delegated responsibility for observation of the portion of the Work of construction affected by the change order, shall bear the approval of the District and shall indicate the associated change in the Project cost, if any.
 - 4. Field Change Documents: In order to expedite construction, field change documents may be submitted. Field change documents shall meet all the requirements necessary for a change order, with the exception of the

approval of the District and the associated change, if any, in costs. The field change document does not require the stamp or seal, but does require the signature of the Architect or Engineers. Work may proceed in accordance with the approved field change document. An official change order shall be submitted to follow up on the field change document as soon as possible.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specified administrative and procedural requirements governing Contract allowances.
 - 1. Allowances as set forth in the Specification are to be used as compensation for items as set forth in this Section. The amounts listed in the schedule and/or Specifications are to be included in the base bid and shall be listed separately in the Schedule of Values and Application for Payment.

1.02 RELATED SECTIONS

- A. Divisions 2-16: Specifications

1.03 ALLOWANCES

- A. Use the allowances only as authorized for DISTRICT purposes and only by an approved allowance disbursement form that indicate the amounts to be charged to the respective allowance amount.
- B. At Substantial Completion of the Work or at any time designated by the ARCHITECT and DISTRICT credit unused amounts remaining in the allowances to the DISTRICT by Change Order.

1.04 ALLOWANCE DISBURSEMENT

- A. CONTRACTOR shall submit a request for allowance disbursement on an allowance disbursement form. Include all substantiating and/or required data along with the request.
- B. The request shall have the requested amount listed as an allowance disbursement without CONTRACTOR overhead and markup.
- C. Once the ARCHITECT and DISTRICT has accepted the disbursement, ARCHITECT and ARCHITECT will sign the allowance disbursement form.

1.05 SCHEDULE OF ALLOWANCES

- A. Include in the base bid the following allowances in the following amounts:

<u>Section</u>	<u>Description</u>	<u>Amount</u>
00300	Bid Form	\$50,000 00

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Product List

1. Within five (5) working days prior to Bid Opening, submit to the Architect five (5) copies of complete lists of all products which are proposed substitutions and those proposed as "or equal:" to products specified, and in accordance with Contract documents.
2. For products specified only by reference standards, select any product meeting standards, by any manufacturer.
3. For products specified by naming several products or manufacturers, select any products and manufacturer named.

1.02 SUBSTITUTIONS

A. Requests for substitutions shall be made only in writing on the "SUBSTITUTIONS REQUEST" form attached with all blanks completed except those reserved for the Design Consultant. All substitution requests shall be made by the Contractor.

B. In connection with the use of any substitute item approved by the Architect it shall be the Contractor's responsibility to see that such items meet all space requirements, and that any alterations to connecting items necessitated by use of the alternate items are properly made, at no increase in cost to the District.

C. In making request for substitutions, Bidder/Contractor represents that:

1. He has investigated the proposed products or method and determined that it is equal or better in all respects to that specified and that it fully complies with all requirements of the Contract Documents.
2. He will meet all contract obligations with regards to this substitution;
3. He will coordinate installation of accepted substitutions into the work, making all such changes and any required schedule adjustments, at no additional cost to the District, as may be required for the work to be completed in all respects;
4. He waives all claims for additional costs and additional time related to substitutions which consequently become apparent. He also agrees to hold the District and Architect harmless from claims for extra costs and time incurred by other subcontractors and suppliers, or additional services which may have to be performed by the Architect, for changes or extra work that may, at some time or date, be determined to be necessary in order for the work to function in the manner intended in the Contract Documents.
5. He shall provide the same warranty and guarantee, and perform any work required in accordance therewith, for the substitution that is applicable to the specified item for which the substitution is requested;

SUBSTITUTIONS AND PRODUCT OPTIONS

6. Material shall be installed, handled, store, adjusted, tested, and operated in accordance with the manufacturer's recommendation and as specified in the Contract Documents.
7. In all cases, new materials shall be used unless this provision is waived by written notice from the Architect or unless otherwise specified in the Contract Documents; and
8. All material and workmanship shall in every respect be in accordance with and in conformity with approved modern and accepted industry practices, and shall conform to all applicable codes, regulations, laws, ordinances, and Contract Documents.

1.03 DESIGN PROFESSIONAL OPTIONS

- A. The Architect will be sole judge of acceptability of any proposed substitutions, and only approved substitutions that are accepted in writing may be used on contract work.
- B. Each request for substitution approval shall include:
 1. "Substitution Request" form with all required data completed, and accompanying specifications, etc., in triplicate.
 2. Identity of product for which substitution is requested; include specifications page and paragraph number.
 3. Identity of substitution; include complete product description, drawings, photographs, performance and test data, and any other information necessary for evaluation.
 4. Quality and technical specification comparison of proposed substitution with specified products.
 5. A description of changes required in other work because of substitution.
 6. Effect on construction progress schedule.
 7. Cost comparison of proposed substitution with specified product.
 8. Any required license fees or royalties.
 9. Availability of local maintenance service within a 50 mile air radius of the project.
 10. Source of replacement material or spare parts; if necessary, within a 50 mile air radius of the project.

1.04 SUBSTITUTION REQUESTS DURING BIDDING PERIOD

No request for substitution approval will be considered unless written request in triplicate has been submitted on the "Substitution Request" form included herein, and has been received by the Architect at least ten (10) working days prior to bid opening date. The Architect will issue addenda prior to bid opening listing all approved substitutions, should there be any approved.

1.05 SUBSTITUTION REQUESTS AFTER CONTRACT AWARD

- A. Approval will be granted only when:
 1. Specified product cannot be delivered without project delay, or
 2. Specified product has been discontinued, or,
 3. Specified product has been replaced by superior product, or

SUBSTITUTIONS AND PRODUCT OPTIONS

4. Specified product cannot be guaranteed as specified, or
 5. Specified product will not fit within designated space, or
 6. Substitution otherwise determined by the District to be in its best interest.
- B. The Contractor's request for substitution shall be accompanied by evidence documenting the reason for the substitution falls within one or more of the cases listed in A1 through A6 above.
- C. A Construction Change Document authorizing substitutions and revising Contract Sum where appropriate will be issued for approved substitutions.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

SUBSTITUTION REQUEST (in triplicate)

TO: _____

PROJECT: _____

SPECIFIED ITEM: _____

SECTION	PAGE	PARAGRAPH	DESCRIPTION
---------	------	-----------	-------------

The undersigned requests consideration for the following:

PROPOSED SUBSTITUTION: _____

STATE THE REASON(S) FOR PROPOSED SUBSTITUTION: (REASON MUST CONFORM TO ONE OR MORE CASES LISTED IN PARAGRAPH 1.05 A1 THROUGH 1.0A6.)

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request and applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents which the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitution does not affect dimensions shown on drawings:
- 2 The undersigned will pay for changes to the building design, including Architect's and engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule or specified warranty requirements.
4. Maintenance and service parts will be locally available (<50 miles from project) for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

For use by the Architect:

Signature: _____	<input type="checkbox"/> Accepted	<input type="checkbox"/> Accepted as noted
Firm: _____	<input type="checkbox"/> Not Accepted	<input type="checkbox"/> Received too late

Address: _____ By: _____

_____ Date: _____

Date: _____ Remarks: _____

Telephone: _____

Attachments: _____

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedure for requesting clarification of the intent of the Contract Documents.

1.02 RELATED SECTIONS

- A. Section 01 11 00: Summary of the Project
- B. Section 01 77 00: Project Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 PROCEDURE

- A. Prime Contractor shall prepare a Request for Information on the form provided and approved by the Architect and District. Prior to the submission of any RFI Prime Contractor is responsible for thoroughly reviewing all contract documents to insure that the answer to the question is not contained therein. Prime Contractor shall transmit the Request for Information to the Architect with any supporting information.
- B. Prime Contractor shall maintain a log of all RFI's that he submits to the Architect on a weekly basis at the weekly project meetings. RFI's shall be identified with a sequential number and be dated. Reference your company's name and the name of the subcontractor asking the question, if applicable, as well as the scope of work.
- C. RFI question and location shall be specific and clear. Indicate reference to construction documents sheet and detail number, as well as specification section.
- D. ARCHITECT response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.

- E. A Request for Information may be returned with a stamp or notation "Not Reviewed", if, in the opinion of ARCHITECT:
 - 1. The requested clarification is ambiguous or unclear to ARCHITECT.
 - 2. The requested clarification is equally available to the requesting party by researching and/or examining the Contract Documents.
 - 3. Prime Contractor has not reviewed the Request for Information prior to submittal to Architect.
- F. Allow a minimum of seven (7) calendar days for review and response time, after receipt by ARCHITECT. Architect will forward response to Contractor and Project Manager and DSA Inspector.

END OF SECTION



**Bonita Unified School District
Maintenance, Operations and Facilities Services**

Email to: Architecture 9 PLLLP
email address: mgelsinger@architecture9.com

Project Name: _____

Construction Request for Information (RFI)

To: _____ **RFI No.** _____

From: _____ **Date:** _____

Required by: _____ **Answered:** _____

REFERENCE:

Drawing(s) _____ **Specification(s)** _____ **Page(s)** _____

REQUEST:

RESPONSE:

RESOLUTION:

- ☐ No Change to Contract Document Required
- ☐ Changes Reflected in Addendum No.
- ☐ Schedule Impact - TBD

Issued By: _____

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedure for submission of a Schedule of Values for review and approval by the District Representative.

1.02 RELATED SECTIONS

- A. General Conditions.
- B. Construction Services Agreement
- C. Section 01 21 00: Allowances.
- D. Section 01 23 00: Alternates.
- E. Section 01 29 76: Progress Payment Procedures.
- F. Section 01 31 13: Project Coordination.
- G. Section 01 32 13: Construction Schedule.
- H. Section 01 32 29: Project Forms.
- I. Section 01 33 00: Submittal Procedures.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PREPARATION

- A. In accordance with the General Conditions, Contractor shall commence preparation of a Schedule of Values on the form included in Section 01 32 29.
- B. Contractor shall coordinate the preparation of a Schedule of Values with preparation of the Construction Schedule as set forth in Section 01 32 13.
- C. Round amounts to the nearest whole dollar; the total shall equal the Contract Amount.
- D. Provide a breakdown of the Contract Amount in enough detail acceptable to District Representative to facilitate continued evaluation of Application for Payment and progress reports. Coordinate with the Project Manual table of contents and Schedule of Values form under Section 01 32 29. Provide breakdown of all subcontract amounts.
- E. Provide separate line items for items in the Schedule of Values for total installed value of that part of the Work.
- F. Provide separate line item for labor and material when applicable.

SCHEDULE OF VALUES PROCEDURES

- G. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item except the amounts shown as separate line items as indicated under Schedule of Values form.
- H. Temporary facilities and other cost items that are not direct cost of actual work-in-place shall be shown as separate line items as indicated under Schedule of Values form.
- I. If at any time, District Representative determines, in its reasonable discretion, that the schedule of Values does not approximate the actual cost being incurred by Contractor to perform the Work, Contractor shall prepare, for District Representative approval, a revised Schedule of Values, which then shall be used as the basis for future progress payments. Without changing the Contract Amount, District Representative reserves the right to require Contractor:
 - 1. To increase or decrease amounts within the line items in the Schedule of Values; and,
 - 2. To conform the price breakdown to Owner accounting practice.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements relative to an Application for Payment.
 - 1. Coordinate the Schedule of Values and Application for Payment with, but not limited to, the Construction Schedule, submittal log, and list of Subcontractors.

1.02 RELATED SECTIONS

- A. General Conditions.
- B. Construction Services Agreement.
- C. Section 01 21 00: Allowances.
- D. Section 01 23 00: Alternates.
- E. Section 01 29 73: Schedule of Values Procedures.
- F. Section 01 32 13: Construction Schedule.
- G. Section 01 32 29: Project Forms.
- H. Section 01 77 00: Contract Closeout.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 APPLICATION FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as reviewed by Project Inspector, Architect, and District Representative. The following Applications for Payment involve additional requirements:
 - 1. The Initial Application for Payment
 - 2. The Final Application for Payment
- B. Payment Application Times: The period of Work covered by each Application for Payment is the payment date for each progress payment as specified in the General Conditions. The period covered by each Application for Payment is the previous month.
- C. Contractor shall submit a draft Application for Payment seven (7) days prior to the first of each month, to be reviewed by the Architect, District Representative, and Project Inspector.
- D. Application Preparation: Complete every entry on the form. Include execution by a person authorized to sign legal documents on behalf of Contractor.

- E. Transmittal: Submit a minimum of five (5) wet signature originals of each Application for Payment to the District Representative. All copies shall be complete, including releases and similar attachments.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to District Representative.
- F. *Initial Application for Payment:* Administrative actions and submittals, that must precede or coincide with submittal for the first Application for Payment include, but are not limited to, the following:
 - 1. Schedule of Values.
 - 2. Construction Schedule.
 - 3. Submittal Schedule.
 - 4. Emergency Contact List.
 - 5. OCIP Enrollment.
 - 6. Cal/OHSA Trenching Permit and Named Competent Person.
- G. *Applications for Payment:* Administrative actions and submittals that must precede or coincide with submittal of Progress Applications for Payment include, but are not limited to, the following:
 - 1. Certified Payroll (submitted directly to Labor Compliance Consultant in electronic format as specified by District Representative).
 - 2. Updated and current Project Record Drawings (as-built). Visual verification necessary only.
 - 3. Monthly Construction Schedule (updated, submitted and approved).
 - 4. Approved Schedule of Values.
 - 5. List of Subcontractors (Payments Summary).
 - 6. Waivers and Releases.
 - 7. Updated Submittal Schedule.
 - 8. Material invoices, evidence of equipment purchases, rentals, and other backup materials to support cost as requested by the District Representative.
- H. *Final Payment Application:* Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include, but are not limited to, the following:
 - 1. Project Inspector's sign-off and final approval of Project's DSA Form(s) 152.
 - 2. Contractor's submission of Contractor's Verified Report DSA Form 6-C.
 - 3. Completion of Contract Closeout requirements.
 - 4. Updated and Final As-Built drawings - in accordance with General Conditions.
 - 5. Completion and acceptance of final punch list items.
 - 6. Delivery of extra materials, products, and/or stock.
 - 7. Identification of unsettled claims.
 - 8. Proof that taxes, fees, and similar obligations are paid.

9. Operating and maintenance instruction manuals.
 10. Consent of surety to final payment.
 11. Waivers and releases.
 12. Warranties, guarantees and maintenance agreements.
 13. Training.
 14. Removal of temporary facilities and services.
 15. Removal of surplus materials, rubbish, and similar elements.
 16. Deductive items pursuant to the General Conditions.
 17. Completion and submission of all final change orders for the project.
- I. Any payments made to Contractor where criteria set forth above have not been met shall not constitute a waiver of said criteria by District Representative. Instead, such payment shall be construed as a good faith effort by District Representative to resolve differences so Contractor may pay its Subcontractors and suppliers and that Contractor agrees that failure to submit such items may constitute a breach of contract by Contractor and may subject Contractor to termination.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Coordination of Work of Contract.

1.02 RELATED REQUIREMENTS

- A. Section 00700 - General Conditions
- B. Section 01 25 13 - Substitutions and Product Options
- C. Section 01 31 19 - Project Meetings
- D. Section 01 33 00 - Shop Drawings, Product Data and Samples
- E. Section 01 77 00 - Contract Closeout

1.03 SUBMITTALS

- A. Coordination Drawings: Submit in accordance with Section 01 33 00, as specified herein.
- B. Work Plans: Submit as specified herein.

1.04 DESCRIPTION

- A. Coordinate scheduling, work activities, submittals, including deferred approvals, District separate contracts and work of the various sections of Specifications in accordance with the Master Project Schedule.
- B. Coordinate sequence of Work to accommodate District's separate contract and District's Occupancy as specified in Section 01 11 00.
- C. Set up control procedures so that the Master Project Schedule is adhered. Contractor's responsibility is to properly notify District's Project Manager of anticipated and actual time delays. Refer to General Conditions.
- D. Coordinate the Work and do not delegate responsibility for coordination to any Subcontractor.
- E. Anticipate the interrelationship of all Subcontractors, District separate contracts, and their relationship with the Work
- F. Resolve differences or disputes between Subcontractors concerning coordination, OR interference of Work between SECTIONS.

1.05 NOT USED

1.06 NOT

USED

1.07 COORDINATION

- A. General: Work of the Contract includes coordination of the entire work of the Project, from beginning of construction activity through Project close-out and warranty periods.
- B. Mechanical/Electrical Requirements of General Work: Comply with applicable requirements of Division 23 Sections for Mechanical Provisions within units of General Work, and comply with applicable requirements of Division 26 for Electrical provisions within units of General Work.
- C. Service Connections: Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.
- D. Coordination: The Project will require close cooperation and coordination with the school site administration, the Architectural team, District Project Manager, and Contractor and Subcontractors. The Contractor shall consider all such coordination in his work inclusive, but not limited to, scheduling and proper sequencing of the Work with subcontractors and the District school site calendar and times that work cannot be, or occupied areas of the project school site that cannot be undertaken, during the entire project. In particular, the coordination of work before District's substantial completion of each project phase, and ensuring the site administration, the Architectural team, Inspector, and District Project Manager are fully advised of his activities to complete the Work in accordance with the Master Project Schedule.
- E. Coordination/Engineering Drawings:
 - 1. Contractor shall prepare and submit complete 1/4 " = 1'-0" coordination drawings, including plans, sections, details, etc., indicating the complete layout and all mechanical and electrical materials and equipment in all areas and within the ceiling spaces for new and existing conditions, including bottom of duct, pipe, conduit and elevations to allow District Architectural team to review with other Prime Trade Contractors' work that Contractor ensures will be coordinated properly.
 - 2. Mechanical, plumbing and electrical Prime Trade Contractors shall be responsible for providing all vertical sections through floors showing structural physical restraints, architectural restraints, plenum spaces and all other physical obstructions that may affect work.
 - 3. Electronic reproduction or photo reproduction of the project's Architectural, Structural, or MEP drawings will not be acceptable.
- F. Mechanical, plumbing and electrical Prime Trade Contractors shall prepare a 1/4" sleeving layout indicating size and location of sleeves. Provide copies to applicable trades and District Architectural team.

- G. Coordination/Engineering Drawings: These drawings are for the Contractor's and District's Representative's use during construction and shall not be construed as replacing any shop drawings, "as-built", or Record Drawings required elsewhere in these Contract Documents.
- H. Debris Removal and Material Access: An area will be designated for debris removal and material access as agreed by the Contractor and Architectural team at the school site.

1.08 EQUIPMENT COORDINATION

- A. Equipment Coordination: With respect to mechanical and electrical features of Contractor and/or District supplied equipment, complete data must be exchanged directly between the Contractor and those vendors and subcontractors involved as the progress of the Project requires. The person requesting the information shall advise when it will be required.
- B. The Prime Trade Contractor's for casework and equipment are expressly required to provide large scale layout drawings for casework and equipment showing the required rough-in locations of all services (dimensioned from building features) service characteristics, and locations of studs where the location is critical to mounting or otherwise installing equipment and casework. Furnish sizes and spacing required for Mechanical and Electrical cutouts, and a complete brochure of fittings, sinks, outlets, or other information to provide complete data on the items and accessories being furnished.
- C. In the event of incorrect, incomplete, delayed or improperly identified information, the entity causing the delay or error shall be responsible and pay for any modifications or replacements necessary to provide a correct, proper and new installation, including relocations required.

1.09 MEETINGS

- A. In addition to progress meetings specified in Section 01 31 19, attend coordination meetings and pre-installation conferences with requisite personnel to assure coordination of Work when scheduled with the Architectural, Engineer, Inspector, or Project Manager.

1.10 COORDINATION OF SUBMITTALS

- A. Schedule and coordinate submittals as required and as specified in Section 01 33 00.
- B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such materials and equipment.
- C. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other sections.

- D. Prime Trade Contractors shall submit the following drawings for review and approval:
 - 1. Fire Protection Drawings: Refer to Division 21.
 - 2. Fire Alarm System: Refer to Division 28.

1.11 COORDINATION OF SPACE

- A. Mechanical, plumbing and electrical Prime Trade Contractors shall coordinate use of Project space and sequence of installation of mechanical, and electrical work which is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- B. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- C. Off-Site Fabrication: Off-site fabrication is encouraged as much as possible and deliveries scheduled so materials and equipment can be installed immediately after delivery. The Contractors shall alert and advise material men of the need to hold deliveries until they are notified the materials are required on the site.

1.12 ELECTRICAL COORDINATION

- A. Provide supervision, communications, and coordination necessary to meet the requirements of electrical power connection as set forth by the designated power company.
- B. Provide reasonable and convenient staging and access areas near buildings to permit the respective Utility or its vendors or subcontractors, to install, modify or remove equipment and other components of the electrical power system furnished and installed by the designated power company.

1.13 COORDINATION OF CONTRACT CLOSEOUT

- A. Coordinate completion and cleanup of work of separate sections in preparation of District school site occupancy with approval of final cleanup by the Inspector and Project Manager.
- B. After District occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of District/school activities.
- C. Assemble and coordinate closeout submittals specified in Section 01 77 00.

1.14 NOT USED

1.15 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The Drawings show, if applicable, existing above and below grade structures, drainage lines, storm drains, sewers, water, gas, electrical, hot water, and other utilities which are known to the District.
- B. Locate all known existing installations before proceeding with construction operations which may cause damage to such installations. Existing installations shall be kept in service where possible and damage to them shall be repaired with no adjustment of Contract Sum. District archives as-built drawings, and Contractor shall be responsible to request to view any and all drawings for the areas that may be affected in the construction before the work begins.
- C. If any unforeseen structures or utilities are encountered, request District's Architectural Team to provide direction on how to proceed with the Work.
- D. If any structure or utility is damaged, take appropriate action to ensure the safety of persons and property and report the same to the District's Architectural Team, and begin immediate remediation of any safety-related condition.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION - NOT USED.

END OF SECTION

PART 1-GENERAL

1.01 SUMMARY

A. Work Included in this Section:

1. The Contractor's participation in preconstruction conference, application for payment, and guarantees, bonds, service and maintenance contracts review meetings.
2. The Contractor's administration and participation in project weekly progress meetings, pre-installation conferences and other meetings, as necessary.

1.02 PRE-CONSTRUCTION CONFERENCE

A. Prior to commencement of Work, attend a pre-construction conference at time and a place selected by the School District to discuss procedures to be followed during the course of the work.

B. The purpose of the conference is to introduce the District Project with the Architectural Team, the Inspector, the Construction/Project Managers, and the School's Representative key personnel, to review the contract provisions, project procedures, and other items pertaining to the Project; distribute documents including sample forms referenced in the Contract Documents; answer any questions related to construction contract administration; and establish schedule and procedures for future meetings. (This meeting is NOT to discuss any construction related specific specifications and drawings, nor address any requests for substitutions, etc.)

C. Attending shall be:

1. District Representatives from Planning, Development and Facilities, Facility and Support Operations, and/or the Business Office.
2. School Site Representatives, including the Construction Liaison
3. The Project Inspector of Record
4. The Architect of Record, and Architect's Construction Architect
5. The Engineering Consultants
6. The Contractor's Contracts Representative/Project Manager
7. The Contractor's on Site Representative/Superintendent
8. Representatives of the major subcontractors, as necessary

1.03 CONSTRUCTION PROGRESS MEETINGS

A. During the course of construction, progress meetings will be held to discuss and resolve field problems.

B. Meeting Schedule: At maximum one-week intervals or more often when required by the Architect/Inspector and/or Project Manager.

C. Meeting Location: As designated by the District's Project Manager, in conjunction with the School Site liaison.

D. Attending shall be:

1. The District's Representative from Planning, Development and Facilities, Facility and Support Operations, and/or the Business Office
2. The Project Inspector of Record
3. The Architect's Construction Architect
4. The Engineering Consultants as appropriate to the Meeting Minute format, and as agreed upon by the Contractor and the Project Manager beforehand
5. The Contractor's On-Site Superintendent
6. The Contractor's Representative/Project Manager
7. Representatives of subcontractors/major suppliers as appropriate to a specific item of the Meeting Minute format, and at the time the specific item is reflected on the Meeting Minutes.
8. Others as appropriate to the Meeting Minute format and as agreed upon by the Contractor and the Project Manager beforehand.

NOTE: Representatives of the Contractor, subcontractors and suppliers attending Construction Progress Meetings shall be qualified and authorized to act on behalf of the entity each represents.

E. Suggested Agenda:

1. Review and approve minutes of previous meeting.
2. Review Construction Project Schedule and Daily Reports.
3. Review of work progress since previous meeting.
4. Review of upcoming work to take place on Two-week-Look-Ahead Schedule.
5. Discuss School Site concerns with regard to safety, paths of travel, and any upcoming events that may affect the work schedule.
6. Discuss field observations, problems, and decisions, affecting the work.
7. Review submittals schedule and status of submittals.
8. Review status of proposed substitutions, if any.
9. Review off-site fabrication and delivery schedules.
10. Review maintenance of progress schedule.
11. Agree on corrective measures to regain projected schedules, as necessary.
12. Review planned progress during succeeding work period.
13. Review coordination of projected progress.
14. Review maintenance of quality and work standards.
15. Review project safety of workers and practices.
16. Review any Inspector of Record Field Notices, or Deviations logs.
17. Other items relating to the Work.

F. The Architect, in coordination with the Project Manager, will make physical arrangements for project meetings, and the Architect shall prepare agenda, preside at meetings, record minutes, and distribute electronic draft copies of Minutes within three working days after Construction Project Meetings to the Project Manager, Inspector, conference participants and those affected by

the decisions made at the conference. The Architect will record in the minutes significant discussions and agreements and disagreements.

1.04 PRE-INSTALLATION CONFERENCES

- A. The Architect/Inspector may conduct a pre-installation conference at the site before each construction activity that the Architect/Inspector deems requires coordination with other construction or when required by the Construction documents.
- B. Attendance will be required of parties directly affecting, or affected by, or involved in the installation, and its coordination or integration with other materials and installations that have preceded or will follow the particular item of work or activity under consideration. Parties attending the conference shall be qualified and authorized to act on behalf of entity each represents.
- C. Conference Schedule: Schedule conference to assure a sufficient amount of time prior to the scheduled work or activity under consideration so that any concerns, problems or disagreements can be resolved without delaying the Project.
- D. The Architect, on conjunction with the Inspector, will make physical arrangements for conferences, prepare the agenda, preside at conferences, record minutes, and distribute copies within two working days after a conference to the Project Manager, Inspector, conference participants and those affected by the decisions made at the conference. The Architect will record in the progress meeting minutes significant discussions and agreements and disagreements as takes place in pre-installation conferences.
- E. Suggested Agenda: Review the progress of other construction activities and preparations for the particular activity under consideration, including requirements for:
 - 1. Contract Documents
 - 2. Options
 - 3. Related Change Orders
 - 4. Purchases
 - 5. Deliveries
 - 6. Shop Drawings, Product Data and quality control Samples
 - 7. Possible conflicts
 - 8. Compatibility problems
 - 9. Time Schedules
 - 10. Weather limitations
 - 11. Manufacturer's recommendations
 - 12. Compatibility of materials
 - 13. Acceptability of substrates
 - 14. Temporary facilities
 - 15. Space and access limitations
 - 16. Governing regulations

17. Safety
 18. Inspection and testing requirements
 19. Required performance results
 20. Recording requirements
 21. Protection
- F. Do not proceed with the work or activity if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

1.05 OTHER REQUIRED MEETINGS

- A. Project Closeout Meeting:
1. Thirty (30) days prior to the estimated substantial completion the project/phase, the Architect, Inspector, and Project will coordinate a meeting to review required construction maintenance manuals, guarantees, closeout submittals, bonds, and service contracts for materials and equipment; review and implement repair and replacement of defective items, and extend service and maintenance contracts, and schedule site training for all equipment.
 2. Attending shall be:
 - a. The District's Representative of Planning, Development and Facilities, Facility and Support Operations, and/or Business Office
 - b. The Project Inspector
 - c. The Construction/Project Manager
 - d. The Engineering Consultants, as appropriate
 - e. The Contractor's on-site Superintendent
 - f. Subcontractors, as appropriate
 - g. Suppliers, as appropriate
 - h. Others, as appropriate
- B. Guarantees, Bonds, and Service and Maintenance Review Meeting:
1. Eleven months following the date of Substantial Completion, the District Project Manager will convene a meeting for the purpose of reviewing the guarantees, bonds, and service and maintenance contracts for materials and equipment.
 2. Attending shall be:
 - a. The District's Representative
 - b. The Architect
 - c. The Engineering Consultants, as appropriate
 - d. The Contractor's Representative
 - e. Subcontractors and Suppliers, only as appropriate
 - f. Others as appropriate

1.06 PRIME TRADE CONTRACTOR MEETINGS

A. Construction Progress Meetings:

1. To be held at maximum one-week intervals or more often when required by the Architect/Inspector/Construction Project Manager.
2. Meeting Location: Contractor Jobsite trailer
3. All Prime Trade Contractors shall attend in order to review progress of work, and submit any questions or requests to the Contractor in order to ensure coordination of installations during the work schedule.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction Project Schedule procedures, preparation, submittal, updates, and revisions.

1.02 RELATED REQUIREMENTS

- A. General Conditions.
- B. Construction Services Agreement.
- C. Section 01 11 00: Summary of Work.
- D. Section 01 29 73: Schedule of Values Procedures.
- E. Section 01 29 76: Progress Payment Procedures.
- F. Section 01 31 13: Project Coordination.
- G. Section 01 33 00: Submittal Procedures.
- H. Section 01 45 23: Testing and Inspection.
- I. Section 01 50 00: Construction Facilities and Temporary Controls.
- J. Section 01 78 36: Warranty and Bonds.

1.03 PROCEDURES

- A. Within seven (7) calendar days after date of Notice to Proceed, Contractor shall submit to District Representative for review, a detailed Construction Schedule ("Preliminary Baseline Schedule") setting forth all requirements for complete execution of the Work.
- B. Within seven (7) calendar days after receipt of the District Representative's review comments, submit a final Construction Schedule acceptable to District Representative ("Approved Baseline Schedule").
- C. Include a written summary narrative sufficiently comprehensive to explain basis of Contractor's approach to work.
- D. If a Construction Project Schedule is considered by District Representative to not be in compliance with any requirement of the Contract, Contractor will be notified to review and revise the Construction Schedule and bring it into compliance. Failure of Contractor to submit a Construction Schedule in full compliance with the Contract Documents will result in withholding of progress payment in accordance with the General Conditions or Construction Services Agreement. The Construction Schedule is to be used in evaluating progress for payment approval.

- E. Subsequently with each Progress Payment Request, Contractor shall deliver to District Representative an updated Construction Schedule reflecting Work progress to the end of the Progress Payment Request period. Each such Construction Schedule shall indicate actual progress to date in execution of the Work, together with a projected schedule for completion of all the Work.

1.04 SCHEDULE SUBMITTAL PREPARATION GUIDELINES

- A. The Contract Work shall be scheduled and progress monitored using a Critical Path Method (CPM) network type scheduling system. Schedule shall be broken into sub-activities which shall, as a minimum, include major suppliers, all submittal approvals, all major trades, plumbing, mechanical, electrical, security, fire, and elevators and escalators. Scheduling system shall indicate all inter-relationships between trades and suppliers.
- B. Contractor shall utilize the Critical Path Method (CPM) in the development and maintenance of the construction schedule network.
- C. Duration and events indicated on schedule shall conform to phasing set forth in Section 01 12 16: Phasing of the Work (if applicable) and shall show any area or building within a particular phase. Schedule shall indicate any and all Contract "milestone events" and other milestones agreed to by District Representative, but no other manually-imposed dates will be accepted unless approved by District Representative.
- D. Construction Schedule shall represent a practical plan to complete the Work within the Contract time requirement.
 - 1. A schedule extending beyond Contract time or less than Contract time will not be acceptable.
 - 2. A schedule found unacceptable by District Representative shall be revised by Contractor and resubmitted.
- E. Construction schedule shall clearly indicate sequence of construction activities, grouped by applicable phase and sorted by areas, buildings, or facilities within phase, and shall specifically indicate:
 - 1. Start and completion of all Work items, their major components, and interim milestone completion dates, as determined by Contractor and District Representative.
 - 2. Activities for procurement, delivery, installation of equipment, materials, and other supplies, including:
 - a. Time for submittals, resubmittals, and reviews. Include decision dates for selection of finishes.
 - b. Time for manufactured products for the Work fabrication and delivery.
 - c. Interdependence of procurement and construction activities.
 - d. As applicable, dates for testing, balancing equipment, and final inspection.

- F. Schedule shall be in sufficient detail to assure adequate planning and execution of the Work.
 - 1. Each task activity shall range in duration from a 1 workday minimum to a fifteen (15) workday maximum and shall be total of actual days required for completion. The activity duration shall include consideration of weather impact on completion of that activity.
 - 2. Schedule shall be suitable, in judgment of District Representative, to allow monitoring and evaluation of progress in performance of the Work; it shall be calendar time-scaled.
 - 3. Activities shall include:
 - a. Description; what is to be accomplished and where.
 - b. Workday duration.
 - c. Scheduled activities shall indicate continuous flow, from left to right.
 - 4. Contractor shall setup up the schedule calendar to identify workdays per week and shifts per day worked, non-work days, weekends and holidays.
- G. Failure to include any element of Work required for performance of this Contract shall not excuse Contractor from completing Work required to comply with the Contract Documents, notwithstanding acceptance of Construction Schedule.
- H. Submittal of Construction Schedule shall be understood to be Contractor's confirmation that the schedule meets requirements of the Contract Documents, and that the Work will be executed in sequence indicated in schedule.
- I. All Construction Schedule submittals shall be transmitted with a Letter of Transmittal and shall include six (6) copies and one reproducible copy of a sufficient agreed upon size and the electronic file of the schedule in the format as required by District Representative.

1.05 REVIEWS, UPDATES, AND REVISIONS

- A. District Representative will review and return the initial submittal of Contractor's Construction Schedule, with summary comments. If revisions are required, Contractor shall resubmit Schedule within seven (7) calendar days following receipt of District Representative's comments.
- B. After Contractor and District Representative agree to a base line schedule, it will become the Project Construction Schedule. No changes to the Baseline Schedule will be allowed unless accepted by District Representative.
- C. Contractor shall analyze and update the Project Construction Schedule:
 - 1. As part of monthly payment application, Contractor shall submit to and participate with District Representative in a schedule review to include:
 - a. Actual start dates for Work items started during report period.
 - b. The percent complete on activities that have actual start dates.

- c. Actual completion dates for Work items completed during report period.
 - d. Estimated remaining duration for Work items in progress, which will not exceed original duration for activity.
 - e. Estimated start dates for Work items scheduled to start during month following report period, if applicable.
 - f. Changes in duration of Work items.
 - 2. In case of a change to Contractor's planned sequence of Work, Contractor shall include a narrative report with updated progress schedule which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors, and any proposed revisions for a recovery plan.
 - 3. Change Orders affecting the scheduled completion date shall be clearly identified as separate and new activities integrated into the schedule at the appropriate time and in the appropriate sequence as reviewed and approved by District Representative.
 - 4. The Project Construction Schedule Review will not relieve Contractor of responsibility for accomplishing all Work in accordance with the Contract Documents.
- D. Updates: Contractor shall submit to District Representative, with each payment application, an up-to-date Project Construction Schedule. Contractor submission of the Monthly Updated Project Construction Schedule is a condition precedent to District Representative's approval of Progress Payments. The Update Project Construction Schedule shall include the following:
- 1. Work Item Report: Detailing Work items and dependencies as indicated on the Schedule.
 - 2. Actual Start and End Dates of Activities under construction
 - 3. Separate listing of activities completed during reporting period.
 - 4. Separate listing of activities which are currently in progress, indicating their remaining duration and percentages completed.
 - 5. Separate listing of activities which are causing delay in Work progress.
 - 6. Narrative report to define problem areas, anticipated delays, and impact on the Project Construction Schedule. Contractor shall report corrective action taken, or proposed, and its effect, including effect of changes on schedules of separate contractors.
 - 7. Resolution of conflict between actual Work progress and schedule logic: when out-of-sequence activities develop in the Schedule because of actual construction progress, Contractor shall submit a revised schedule to conform to current job sequence and direction.
- E. If, according to current updated Project Construction Schedule, District Representative determines Contractor is behind schedule or any interim milestone completion dates will not be met, considering all time extensions to which Contractor is entitled, Contractor shall submit a revised recovery

schedule, showing a workable plan and a narrative description to complete the project on time. Refer to General Conditions.

- F. Scheduling of change or extra Work orders is responsibility of Contractor.
 - 1. Contractor shall revise the Project Construction Schedule to incorporate all activities involved in completing change orders or extra Work orders and submit it to District Representative for review.
- G. If District Representative finds Contractor is entitled to extension of any completion date, under provisions of the Contract, District Representative's determination of total number of days of extension will be based upon an analysis of the current Project Construction Schedule, and upon data relevant to the extension.
- H. Contractor acknowledges and agrees that delays to non-critical activities will not be considered a basis for a time extension unless activities become critical. Non-critical activities are those activities which, when delayed, do not affect an interim or Substantial Completion date.
- I. Contractor shall allow Float time for inclement weather, Government Delay, and Project Float in the Baseline Schedule in accordance with the General Conditions. The Inclement Weather Float and the Government Delay Float shall each be identified as a Critical Activity in the Baseline Schedule. No other activities may be concurrent with them. When rainfall at the Project site impacts Critical Path activities, Contractor may provide District Representative with a written request for a rain impact day describing the inclement weather delay on the Critical path activities. The inclement weather delay must be clearly indicated by a seventy-five percent (75%) decrease in the normal field labor workforce hours on Critical Path activities on the day in question as indicated by Contractor's Daily reports from the day in question and the scheduled Work days prior to the day in question. Upon District Representative's independent confirmation of the amount of rainfall and impact, District Representative will authorize Contractor to reduce the duration of the Rain Day Impact Allowance by one day. Rainfall on non-scheduled workdays shall not be granted as rain impact days. If the effects of rain from a non-scheduled Work day carry forward to a scheduled work day and impacts the Critical Path as noted above, then the scheduled work day will be considered impacted by rain.

1.06 CONTRACTOR'S RESPONSIBILITY

- A. Nothing in these requirements shall be deemed to be an usurpation of Contractor's authority and responsibility to plan and schedule Work as Contractor sees fit, subject to all other requirements of Contract Documents.
- B. Contractor shall provide at all times sufficient competent labor, materials, and equipment to properly carry on Work and to insure completion of each part in accordance with Construction Schedule and within time allowed in the Contract.

CONSTRUCTION PROJECT SCHEDULE

- C. Contractor shall be responsible for ensuring that all submittals to the District Representative are accurate and consistent. Damage, including extra time and cost, caused by inaccuracies from Contractor will be compensated by Contractor.

1.07 SUSPENSION OF PAYMENTS

- A. Initial Submittal: If Contractor fails to comply with the specified requirements, District Representative reserves the right to engage an independent scheduling consultant to fulfill these requirements. Upon additional notice to Contractor, District Representative shall retain against Contractor all incurred costs for additional services.
- B. Update Submittals: District Representative has the right to withhold progress payments if Contractor fails to update and submit the Project Construction Schedule and reports as required by District Representative.

1.08 RECORD COPY

- A. Prior to the Contract Completion, Contractor shall submit the Project Construction Schedule showing the as-built sequence. The as-built schedule shall have all activities with actual start and end dates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Coordinate both the listing and timing of reports and other activities required by provisions of this and other Sections, so as to provide consistency and logical coordination between the reports. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Make monthly distribution of the progress schedule and update to all parties involved in the work including the Architect, Inspector, and Project Manager, along with the Request/Application for Payment. In particular provide definition and coordination of the progress schedule, with phases, changes, schedule of values, funding sources and progress reports.
- B. Project (CPM) Schedule:
 - 1. Secure critical time commitments for performing major elements of the work of for the entire duration of the Contract. Within 30 days after the Notice to Proceed, submit a comprehensive Critical Path Method (CPM) chart progress schedule indicating, by stage-coded symbols, milestones for each major specification section, category, or tunit of work to be performed; include minor elements of work, which are, nevertheless, involved in overall sequencing of the work. Include dates for completion of each phase of work. Arrange schedule to show graphically the major sequences of work necessary for the completion of related elements of work. Arrange the schedule to allow for the Architect's review of submittals as well as procedure for certification of substantial completion. Prepare and maintain the schedule on a sheet of sufficient width (or a series of sheets) to show the required data clearly for the entire construction time. Prepare the schedule on sheets of stable transparency, or other reproducible material, to permit reproduction for the required distribution.
 - 2. Utilize MS Project or similar project management software.
 - 3. Provide a minimum 3 days prior to Project Job Meeting to Architect, IOR and District Representative.
- C. Daily Reports: Prepare a daily report, recording the following information concerning events at the site; make available to the Inspector for on-site review and submit duplicate copies to the Inspector and Architect upon request:
 - 1. List of Contractor personnel at the site
 - 2. List of Subcontractors at the site
 - 3. Accurate Count of personnel at the site by trade, and Subcontractor
 - 4. Material and Equipment Deliveries
 - 5. High/low temperatures, and general weather conditions.
 - 6. Accidents or injuries.
 - 7. Meetings and significant decisions.
 - 8. Unusual events.
 - 9. Stoppages, delays, shortages, losses.
 - 10. Emergency procedures, field orders.

11. Orders/requests by governing authorities, signed.
 12. Services connected, disconnected.
 13. Equipment or system tests and start-ups.
 14. Partial completions, occupancies.
 15. Substantial completion requested.
 16. Substantial completion authorized.
 17. Requests for Inspections
- D. Progress Reports: Contractor shall submit "Verified Reports", on prescribed form, of construction per requirements of Title 24, CCR.
- E. Two-Week-Look-Ahead Schedule:
1. Contractor to provide a Two-Week-Look-Ahead Schedule at every Project Job Meeting.
 2. Schedule to include but not limited to the following:
 - a. All work that is projected to occur in the two upcoming weeks.
 - b. Inspections needed to occur.
 - c. Submittal required from Architect.
 - d. District-require items.
 - e. City and/or DSA needed approvals.
 - f. Any site construction that may affect school activities.
 - g. School events that may affect construction activities.
 3. Provide a minimum 3 days prior to Project Job Meeting to Architect, IOR and District Representative.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Procedures.
- B. Contract.
- C. Construction Progress Schedules and Contract Breakdown.
- D. Shop Drawings, Product Data, and Samples.
- E. Manufacturers' Instructions and Certificates.

1.02 RELATED REQUIREMENTS

Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this Work.

1.03 PROCEDURES

- A. All Submittals must be approved by Architect no later than **fourteen (14)** calendar days after the issuance of the **Notice to Proceed**.
- B. Prepare a listing showing principal work-related submittals and their initial submittal dates as required for coordination of the Work. Organize the listing by the related specification number sequence. Submit the listing within seven (7) days after the award of the Contract.
- C. Submit Shop Drawings and product data in accordance with General Conditions. Submittals shall be approved and on file at the Site(s) prior to the initial use of the material, product, plan or system on Site.
- D. Deliver submittals to Architect at address listed on cover of Project Manual.
- E. Identify Project, Contractor, subcontractor, and major supplier; identify pertinent Drawing sheet and detail number, Specifications Section number, as appropriate. Identify deviations from Contract Documents. Provide space for Contractor and Architect review stamps.
- F. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.
- G. The Contractor shall approve submissions prior to submitting for the Architect's review. By approving and submitting Shop Drawings, the Contractor represents that he has determined and verified materials, field measurements, and field construction related criteria, or will do so, and that he has checked and coordinated the information contained with such submittals with the requirements of the Work and the Contract Documents.

- H. After Architect's review of submittal, revise and resubmit as required, identifying changes made since previous submittal.
- I. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.04 CONTRACT

- A. Furnish simultaneously three (3) executed copies of:
 - 1. Agreement.
 - 2. Performance Bond.
 - 3. Payment Bond.
 - 4. Certificate - Worker's Compensation.
 - 5. Certificates showing Proof of Carriage of Insurance required by General Conditions.

1.05 PROJECT FORMS

- A. Submit to District and Architect the following Project Forms for review and approval:
 - 1. Pay Application
 - 2. Schedule of Values
 - 3. Change Order Form
 - 4. Request for Information
 - 5. Critical Path Schedule
 - 6. 2 - Week Look Ahead Schedule
 - 7. Daily Report

1.06 CONSTRUCTION PROGRESS SCHEDULES AND CONTRACT BREAKDOWN

- A. Construction Schedules:
 - 1. Submit horizontal bar chart with separate bar for each major trade or operation, identifying first workday of each week.
 - 2. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Show projected percentages of completion for each item of Work as of each Application for Progress Payment.
 - 3. Show submittal dates required for shop drawings, product data, and samples and product delivery dates, including those furnished by Owner.
- B. Furnish Contract Breakdown per General Conditions:
 - 1. Format: Table of Contents of this Project Manual. Identify each item with number and title of the major Specifications Sections.

1.07 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. General: Refer to General Conditions for basic procedures including Contractor's review of Shop Drawings, product data and samples before submittal to Architect. Submittals without a Contractor's stamp of approval will be returned by the Architect with no action taken.

- B. Coordination: Coordinate the submittals so that one submittal will not be delayed by the Architect's/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.
- C. Shop Drawings:
 - 1. Modify General Conditions requirements to conform to the following.
 - 2. Conform to this Article, except where individual Specifications Section requirements are more stringent.
 - 3. Submit in the form of one reproducible and three (3) opaque reproductions. After review, reproduce and distribute in accordance with requirements in Article on Procedures, above.
- D. Product Data:
 - 1. Product data includes standard printed information on manufactured products that has not been specifically prepared for this project, including but not limited to the following items:
 - a. Manufacturer's product specifications and installation instructions.
 - b. Standard color charts.
 - c. Catalog cuts.
 - d. Standard product operating and maintenance manuals.
 - e. ICC reports, if applicable.
 - 2. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to the Work.
 - 3. Submit the number of copies, which Contractor requires, plus two copies, which will be retained by Architect.
- E. Samples:
 - 1. Include identification on each sample to indicate use, project and building name, manufacturer's name supplier or subcontractor name, and submittal date.
 - 2. Submit full range of manufacturers' standard colors, textures, and patterns for Architect selection. Submit samples for selection of finishes within seven (7) days after date of Contract.
 - 3. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.
 - 4. Submit the number specified in respective Specifications section; one will be retained by Architect. Reviewed samples, which may be used in the Work, are indicated in the Specifications Section.
 - 5. Color Schedule Preparation:
 - a. Promptly submit to Architect samples for materials requiring color selections.

- 1) Submit two (2) sets of samples for materials requiring color selection only.
 - 2) Submit four (4) sets of samples for materials requiring color, pattern, and texture selection.
 - 3) Additional quantities may be requested by Architect.
- b. After such samples are received, Architect will select colors and issue a comprehensive Color Schedule. Color selections will not be made until all samples, indicating color, pattern and texture have been received.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.02 REQUIREMENTS OF REGULATORY AGENCIES:

All pertaining statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction of the Work are hereby incorporated into these Contract Documents the same as if repeated in full herein and such are intended where any reference is made in either the singular or plural to Code or Building Code unless otherwise specified including, without limitation, those in the list below. Contractor shall make available at the site such copies of the listed documents applicable to the Work as the Architect or Owner may request including mentioned portions of the California Administrative Code (CAC).

- A. With respect to the Division of the State of Architect and State Fire Marshal, most-recent adopted Edition.
- B. California Building Standards Code (CBSC), Title 19 CBSC (Public Safety, State Fire Marshal Regulations) Latest Edition and Amendments.
- C. Building Standards Administrative Code, Part 1, Title 24 CBSC, Latest Edition.
- D. California Building Code (CBC), Part 2, Title 24, CBSC (International Building Code with California Amendments) Latest Editions.
- E. California Electrical Code (CEC), Part 3, Title 24, CBSC (National Electrical Code and California Amendments) Latest Editions.
- F. California Mechanical Code (CMC), Part 4, Title 24 CBSC (Uniform Mechanical Code and California Amendments) Latest Editions.
- G. California Plumbing Code (CPC), Part 5, Title 24 CBSC (Uniform Plumbing Code and California Amendments) Latest Editions.
- H. California Energy Code, Part 6, Title 24 CBSC, Latest Edition.
- I. California Fire Code, Part 9, Title 24 C.C.R. (International Fire Code and California Amendments) Latest Editions.
- J. California Green Building Standards (CALGREEN), Part 11, Title 24 CBSC, Latest Edition.
- K. California Referenced Standards, Part 12, Title 24, C.C.R., Latest Edition.
- L. State and Local Public Health Codes, Latest Editions and Amendments.

- M. Other statutes, ordinances, laws, regulations, rules, orders, and codes specified in other Sections of the Specifications or bearing on the Work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All inspection and testing required to establish compliance with Contract Documents and Title 24 CCR requirements, except as may be otherwise specified, shall be made by an independent professional testing agency or firm selected and paid by the Owner/District (or as otherwise noted). All work prior to the call out of the inspection services shall be approved by the Inspector of Record as ready for the inspection services.
- B. The cost of most services for testing and inspection in compliance with Contract Documents requirements will be paid by the Owner. If initial tests indicate non-compliance with Contract Document requirements, any non-compliance testing shall be performed by the same inspection service and back charged to the General Contractor. Schedule portions of the work requiring testing and inspection services so that the time of the agency on the work is as continuous and brief as possible. Should an inspection service be called out without proper pre-inspection and approval by the Inspector of Record, and the Contractor causes the inspection service to be on site for longer than the minimum call-out costs, or the Contractor causes the inspection service to make a return call to the site for the same inspection, the additional costs shall be back-charged to the Contractor.
- C. Concrete Coring Procedures: Prior to the start of any concrete coring, the Contractor shall submit a detailed coring plan, indicating the size and precise locations of the cores, for approval by the Architectural Team/Structural Engineer. Proposed coring locations must be marked in the field and verified by the District IOR. The project Architectural Team/Structural Engineer may also request to perform a field inspection if deemed necessary. The Contractor SHALL arrange for and bear the costs of all Pachometer tests of the areas to be cored.

1.02 CONTRACTOR'S RESPONSIBILITY

- A. Coordination: The Contractor shall initiate and coordinate testing and inspections required by the Contract Documents and public authorities having jurisdiction over the work through the Architect and/or Inspector of Record.
- B. Access: Furnish free and safe access to the various parts of the work and assist testing and inspection personnel in the performance of their duties at no additional cost to the Owner.
- C. Data: Furnish records, drawings, certificates, and similar data as may be required by the testing and inspection personnel to assure compliance with the Contract Documents.
- D. Notification: Provide the Architect and/or Inspector of Record and Testing Laboratory with at least 72 hours advance notification of required testing.

- E. Defective work: Remove and replace any work found defective or not complying with Contract Document requirements at no additional costs to the Owner (shall apply to 1, 2, and 3 immediately below). Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance and as approved by the District IOR.
 - 1. Concrete: If test cylinders for concrete fail to meet design stresses, make core and load tests as may be directed by the Design Professional; make core tests in accordance with an ASTM C42 or most recent update and load tests in accordance with ACI 318 or most recent update. Correct all deficiencies found in forms, reinforcing steel and embedded items.
 - 2. Structural Steel: Should any weld or structural connection fail to meet design stresses, provide sonic or x-ray examination of all structural connections as directed by the Architect/engineer. Replace or repair all defective connections as directed.
 - 3. Roofing membrane work: Should roofing membrane, including associated flashing and jointing, indicate non-compliance with Contract Document requirements, provide corrective work as directed.
- F. Lead Levels in Water: The domestic water piping system shall be protected during tie-ins or other construction activities that have the potential to elevate the lead levels in the water. The water in the domestic water piping shall be tested prior to the start of work and the lead levels documented. Testing shall also be performed upon the completion of all work and any lead contamination, above the levels documented prior to the start of work shall be the Contractors responsibility to reduce the levels to the pre-project levels.
 - 1. If the domestic water system is contaminated as a result of construction activities, the Contractor shall decontaminate the domestic water system. The procedures shall comply with applicable regulatory requirements.

1.03 TESTING LABORATORY RESPONSIBILITY

- A. Taking Specimens: Specimens and samples for testing, unless otherwise provided in the Contract Documents, will be taken by the testing personnel. Sampling equipment and personnel will be provided by the testing laboratory. Deliveries of specimens and samples of the testing laboratory will be performed by the testing laboratory.
 - 1. When the testing laboratory is ready to test, but is prevented from testing or taking specimens due to incompleteness of the work or other scheduling lapses, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

- B. Test Reports: Reports shall include all tests made, regardless of whether such tests indicate that material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Reports shall state which requirements with which the material or materials were sampled and tested. Test reports shall show the indicated or specified design strength(s) and state definitely whether or not the materials tested comply with the specification requirements.

Report distribution shall be made as follows:

Owner's Rep	1 copy, and 1 electronic pdf
Architect	1 copy, and 1 electronic pdf
Structural Engineer	1 copy
Contractor	2 copies
DSA	2 copies (or as req'd by DSA)

- C. The inspection agency shall cooperate with the Contractor so as to cause no delay in the progress of the work, but shall be directly responsible to the Owner for his actions. The inspection agency shall have no authority to direct the work of the Contractor.
- D. Submittals: Promptly submit copies of reports of inspections and tests, mill analysis, concrete mix designs and certifications per applicable sections of the specification.
1. Comply with requirements of each technical specification section and DSA requirements.
 2. Reports shall include all tests made, regardless of whether such test indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were samples and tested in accordance with the requirements of the Title 24 and with the approved specifications. Test reports shall show the specified design strength. They shall also state definitely whether or not the material or materials tested comply with requirements.
 3. Testing Agency is not authorized to:
 - a. Release, revoke, alter, or enlarge on, requirements of Contract Documents.
 - b. Perform any duties of the Contractor.

1.04 REQUIRED INSPECTIONS & TESTS

The following are inspection services and tests required of but not limited to the Inspection and Testing Agency.

- A. Sitework inspections & tests: Perform the following services as required to assure compliance with requirements of Division 2 of the technical specifications.

Compaction & bearing: Test and verify bearing capacity of all load bearing earth, test compaction fills for compliance with required densities.

- B. Concrete work inspections & tests: Perform the following services as required to assure compliance with requirements of Division 3 of the technical specifications.
1. Cast-in-place concrete: Make slump tests for each batch delivered or at least 1 test per hour during continuous pours in accordance with requirements of ASTM C143/C143M-12; check and verify batch consistency. Inspect forms and verify sizes and conditions. Inspect reinforcing and verify its proper placement. Furnish continuous inspection during replacement, repair and patching operations, and curing of concrete. Make cure, and test at least 3 test cylinders of each strength, of concrete for each 50 cubic yards (38.23 m³) placed or for each day's pour, whichever is greater. Report exact mix tested, minimum size aggregate, location of pour in the work, cylinder identification, data of receipt of cylinder in laboratory, slump data, cement brand and type, admixtures used, dates and records offset cylinders, names of inspectors and laboratory personnel, and evaluation or analysis of cause, in case of test failure, and recommendations of remedial action.
 2. Cure specimens under laboratory conditions except when there is possibility of surrounding air temperature falling at project below 40F. In this case, additional specimens will be required to be cured under job conditions. For all test unless otherwise directed, break 1 cylinder at 7 days, 2 at 28 days.
 3. If 7 day tests appear to be marginal or fall below normal requirements, concrete shall be tested with an approved impact hammer. Should these readings verify low test cylinders, procedure of work beyond this point will be Contractor's responsibility until decision is reached as to removal of substandard concrete at each of 28 day period.
- C. Metal work inspection & tests: Perform the following services as required to assure compliance with requirements of Division 5 of the technical specifications.
1. Structural steel fabrication: Furnish visual inspection of all shop fabricated parts including joists and joist girders. This inspection may be done in shop or in field after delivery. Furnish inspection and testing of shop welds in accordance with requirements for welding specification hereinafter. Check shapes, sizes, classes, and types of steel. Verify conformance of structural steel materials with requirements of Contract Documents. Test end welded studs, replace studs damaged by test.
 2. Structural steel field inspection & tests: Check location and fit of all anchorage and inserts. Verify adjustments to fit inaccuracies. Furnish visual inspection of erection of all structural steel components of the work. Furnish inspection and testing of all field welding in accordance with requirements for welding in accordance with requirements for bolting specific hereinafter. Inspect and test all bolted connections in

accordance with requirements for welding specified hereinafter. Inspect for compliance with AISC Code of Standard Practice with requirements of the Contract Documents; other duties and responsibilities as may be noted on drawing.

3. Welding requirements: Furnish visual inspection of all field fillet welding. Furnish inspection of fillet welds in accordance with requirements of AWS D1.1 (Rev. I); allow for inspection of a minimum of 15% of fillet welds by magnetic particle or dry penetrant methods
 4. Bolting requirements: Furnish visual inspection of structural joints where ASTM A325-10e1 bolts are used; verify the applicable requirements of AISC specifications are met.
- D. Thermal and moisture protection work testing & inspection: Perform services as required to assure compliance with requirements of Division 7 of the technical specification.
- E. Roofing: Check deck surfaces prior to application of roofing materials and verify that substrate is in satisfactory conditions to receive roofing. Furnish continuous inspection during application of roofing, including application of vapor barriers, insulation and roofing. Inspect all sheet metal flashings, counterflashing and reglets for satisfactory and waterproof installation.
- F. Wood: Check framing lumber moisture content prior to framing.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Contractor shall ensure that all employees, visitors, subcontractors, subcontractor employees, and suppliers, while on the worksite, comply with the requirements of OSHA, these requirements, and the safety precautions contained in the several Specification Sections.
- B. The Contractor shall promptly and fully comply with and execute, without separate charge thereof to the District, shall enforce compliance with the provisions of the Williams Steiger Occupational Safety Health Act of 1970 (Public Law 91-596 with most recent updates and amendments) with particular attention paid, but not limited to, Title 29-Labor, Chapter XVII - Occupational Safety and Health Administration, Department of Labor Part 1926 - (Safety and Health Regulations for Construction), and part 1910 - (Occupational Safety and Health Standards), as printed, respectively, in the June 24, 1974, and June 27, 1974, Federal Register, and latest adopted amendments and changes thereto.

1.02 PRELIMINARY WORK

- A. Prior to the start of and during the course of the work (above and below ground) the Contractor shall make a thorough survey of the entire worksite to determine all potential hazards. Workmen shall be made aware of those hazards and shall be instructed in procedures and the use of equipment for their protection. The Contractor shall verify the location and condition ("live" or "dead") of all utilities on and near the worksite and take precautions to protect his employees, subcontractors, material men, the general public, and the property.

1.03 IMMINENT DANGER

- A. The District may stop those operations which create an imminent danger to employees (as defined by OSHA), to the public and to property.
- B. The Contractor shall be wholly responsible for any accident (including death) occurring at any time during the progress of the work and until the final acceptance of the work by the District which may happen to any of his employees/workmen or those of any Subcontractor employed on the building, the property, or for any damage or injuries (including death) which his work and operations may cause to the work being constructed, or to existing buildings, or to any tenants and occupants of the property, or of the adjoining properties, or to the public, or to any public or private property.

1.04 COOPERATION:

- A. The Contractor shall cooperate with the safety representatives of the District, District's Insurance Managers and the District's Insurance Company in any and all inquiries before, during, and after the project.

1.05 SAFETY RESPONSIBILITIES:

- A. Contractor's Superintendent shall:
 - 1. Ensure compliance with these requirements, OSHA requirements and other safety requirements, and provide and implement an Injury and Illness Prevention Program (IIPP) at the project site.
 - 2. Provide, supervise, and support a Contractor's Project Safety Supervisor and enable him/her to execute effectively their duties and responsibilities.
 - 3. Authorize immediate action to correct substandard safety conditions.
 - 4. Review and act to ensure compliance with safety procedures with his supervisors, subcontractors and suppliers.
 - 5. Take an active part in all supervisory safety meetings.
 - 6. Cooperate with safety representatives of the District, District Insurance Managers, and the District's insurance company.
 - 7. Ensure that all security and temporary fencing has been secured to prevent any movement or causal action that could contribute to any hazardous or unsafe condition, or which ultimately may cause harm.
- B. Contractor's Project Safety Supervisor shall:
 - 1. Make thorough daily safety inspections of the worksite and immediately act to eliminate unsafe acts and unsafe conditions, and record all suggestions made and corrective action taken.
 - 2. Investigate worksite accidents and recommend immediate corrective action.
 - 3. Weekly safety meetings shall be conducted and documented in the daily report of activity by the contractor. Weekly safety meeting notes shall be recorded, noting the contractors and trades on site, the topics that were discussed and the attendance by contractor name, workmen name and trade, in attendance on the project that day.
 - 4. Review safety meetings reports submitted by job foremen and act to ensure that meaningful weekly safety meetings are held by the job foremen.
 - 5. Attend foremen "tool box" safety meetings and evaluate effectiveness.
 - 6. Assist in the preparation of accident investigation and reporting procedures.
 - 7. Implement training programs for supervisors and employees as they apply to their specific responsibilities.
 - 8. Be responsible for the control, availability, and use of safety equipment, including employee personal protective equipment.
 - 9. Coordinate his activities with those of the District's Inspector and/or Project Manager, and immediately implement their safety suggestions.
 - 10. Coordinate public relations aspects of the Contractor's safety program.
- C. Contractor's Job Foreman shall:
 - 1. Instruct workmen regarding safe work practices and work methods at the time workmen are given work assignments.

2. Furnish and enforce the use of personal protective equipment and suitable tools that are equipped with all the manufacturer's supplied safety features, and have not been altered in any way, for the job.
 3. Continuously check to see that no unsafe practices and conditions are allowed to exist on this portion of the work.
 4. Set a good example for his personnel.
 5. Make a complete investigation of accidents to determine facts necessary to take corrective action to prevent a recurrence, and record the facts in a written report to accompany the daily report as set forth in the IIPP.
 6. Promptly supply information for, or complete, an Accident Report and Investigation Form as directed by the Contractor Safety Supervisor and Contractor's Superintendent/Project Manager.
 7. Hold weekly "tool box" safety meetings with his personnel to:
 - a. Discuss observed unsafe work practices and unsafe conditions.
 - b. Review the accident experience of his crew and discuss correction of the accident causes.
 - c. Encourage safety suggestions from his crew and report those suggestions to the Safety Supervisor.
 8. Ensure that first aid is promptly administered to an injured employee.
 9. Report immediately, to Contractor's Superintendent/Project Manager, or Safety Supervisor, any injuries, or violations of job safety and security.
- D. Subcontractor's Job Superintendent shall:
1. Plan and execute his work so as to comply with the Construction Safety Program.
 2. Furnish and enforce the use of personal protective equipment.
 3. Attend supervisory personnel safety meetings schedule by the Contractor.
 4. Schedule and attend weekly "tool box" safety meetings to be held by job foremen for all employees.
 5. Report to the Contractor's Project Safety Supervisor or Contractor's Superintendent all observed unsafe conditions, unsafe practices, and violations of job security.
 6. Cooperate with the District's safety representative.

1.06 CONTRACTOR'S SAFETY SUPERVISOR:

- A. Contractor shall designate a full-time employee as Contractor Project Safety Supervisor.
- B. Qualifications must be approved by the District. Supervisor shall:
 1. Have heavy construction experience of not less than three (3) years, one of which must have been in a supervisory capacity.
 2. Be familiar with job safety laws and regulations.
 3. Have accident prevention experience.

- C. Duties: Project Safety Supervisor shall conduct regular inspections of the work, shall ensure compliance with job safety requirements, shall maintain the Contractor's safety program IIPP on site and available for review by the District's Inspector and/or Project Manager and shall enforce safe practices, use of safety equipment and personal protective equipment, and other such activities as may be required by OSHA, the safety requirements, and the safety precautions contained in the several Specification Sections.
- D. If the Project Safety Supervisor is not effective in executing the duties assigned him, the District may request, in writing, that the Contractor furnish a new Project Safety Supervisor.
- E. If the Contractor desires to replace the Project Safety Supervisor, he shall so notify the District and the District's Insurance Managers, in writing and shall submit the name, experience and qualifications of the proposed Project Safety Supervisor for approval.

1.07 VEHICLE ESCORT

- A. provide a vehicle, construction equipment and/or any motorized equipment with a forward and rear escort at all times when children are on-site. Escort shall be continuous from parking lot to point-of-construction.

1.08 REQUEST FOR VARIANCES

- A. Request for variances to deviate from OSHA requirements must follow the current established procedures by that Agency.

1.09 FAILURE TO COMPLY

- A. If the Contractor fails to comply with the requirements of OSHA, the safety requirements, and the safety precautions contained in the Specifications Sections, or to provide an on-site IIPP, the District may modify or stop the work and portions thereof, until such failure is remedied. Willful and repeated failure to comply could result in the shutdown of the work, and portions thereof. No part of the time lost due to any such modification of operations or stop orders shall be made the subject of a claim for extension of time or for increased costs of damage by the Contractor.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The District will provide a Project Inspector, or Inspector of Record (IOR) for this project.
- B. Contractor shall submit an Inspection Request Form to the Project Inspector (IOR) at least 48 hours prior to the time the inspection is needed, and on the form required. Contractor shall not cover any work requiring inspection until the Project Inspector (IOR) has inspected and approved the subject work.
- C. For work not in conformance with the Contract Documents, the Project Inspector (IOR) shall submit to the Contractor a Deviation/Non-conforming Notice.
- D. Contractor to provide continuous observation of work any time an employee, sub-contractor, vendor, delivery service, consultant is on-site.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Temporary utilities, construction facilities and project sign(s) which are to be provided and maintained by the Contractor.
- B. Dust and noise control.
- C. General temporary items including staging area for material delivery and safety and security lighting.

1.02 TEMPORARY UTILITIES:

- A. Water:
 - 1. Arrange for water with District Construction/Project Manager and install all necessary water lines, connections and metering devices for project, and upon completion of the work, remove such temporary facilities.
 - 2. District will pay for all water needed for construction. Water conservation techniques are to be observed by all workmen. Contractor is to provide and maintain all water conveyance equipment, hoses, nozzles, hose bib connections, free from leaks, and equip all hoses with positive closing, hand-squeeze-type operating nozzles - - it is not permitted to operate a hose without a positive closing nozzle.
 - 3. Provide suitable drainage system, subject to the approval of the Architect/Engineer and as indicated on the approved SWPPP, to carry construction waste water from site to an approved disposal location.
- B. Electricity:
 - 1. District will pay for all electricity needed for construction. Contractor is to arrange for and install all necessary temporary poles, wiring and metering devices and, upon completion of the work, remove such temporary facilities. Electricity conservation best management practices shall be observed by all workmen, and any unnecessary lighting, or electrical discharge shall be turned off at the end of each shift. Only safety lighting is allowed after each shift is concluded.
 - 2. Furnish and install area distribution boxes, so located that the individual trades may use 100 foot maximum length extension cords to obtain adequate power and work task lighting, at points where required for the work, for inspection and for safety.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

3. Provide all electricity needed for construction including connections for construction equipment requiring power.
 4. Lighting in the construction work area shall be sufficient to allow safe travel for workmen and the Architectural team during normal working hours of the project, and shall be shut down to conserve energy after normal construction working hours.
- C. Natural Gas: The Contractor shall provide and install gas equipment and piping necessary to perform his work, and shall remove same upon completion of the work. The Contractor shall pay for the Natural gas used in the work.
- D. Telephone/Communications/Data:
1. Make necessary arrangements and pay costs for installation and operation of telephone, communication, or data service to the Contractor's office at the site.
- E. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.
- F. Make required connections to existing utility systems with minimum disruption to services in the existing utility systems. When disruption of the existing service is required, do not proceed without the Architect and/or Inspector's approval with at least 72 hours written request and approval. When required, provide alternate temporary service, should it be necessary as deemed by the Architect and/or Inspector, or Project Manager.
- 1.03 CONTRACTOR'S FACILITIES:
- Contractor shall provide temporary offices, storage sheds, fencing, barricades, signage, hoists, scaffolds, railings and other facilities as required and specified. Installation and maintenance of such items shall be the responsibility of the Contractor.
- A. Temporary Offices for Contractor, the District Project Manager and District Inspector of Record.
1. Not Required.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

B. Sanitary Facilities:

1. The Contractor shall provide temporary toilet facilities which may consist of portable chemical toilets, and hand washing equipment. Number of toilets shall be based on number of workers with a minimum of 1 toilet facility per 10 workers. Placement of temporary toilet facilities shall be agreed upon at the site with the District Construction/Project Manager.
2. Toilet facilities shall be kept supplied with toilet paper, and kept in a clean and sanitary condition until completion of the work, and then be removed from the work site. Upon removal, that portion of the site shall be properly cleaned and graded/repaired.

C. Contractor's Security Barricade:

1. The Contractor shall erect the temporary security barricades for the purpose of defining construction lay-down areas, staging area and work zones. Temporary security barricades shall be provided on school site at exterior locations, and at building interiors, as necessary to provide a clear, obvious separation between school users and construction personnel. New or used material may be used.
2. Unless otherwise indicated or specified, barricade shall be constructed of 6'-0" high chain link fence material with T-post condition at bottom for stability, shall have top rails, and 6 gauge minimum wire support at the bottom, BLACK screen material securely attached to the chain link material. Space posts not to exceed 10 feet on centers. Posts shall be of the following nominal pipe dimensions: terminal, corner, and gate posts 2-1/2", line posts 2", with diagonal supports at each corner. Chain link fabric shall be not less than 13 gauge, 2" mesh, and in one width. Posts, fabric and accessories shall be galvanized. Some fencing may require terminal posts to be sunk in the ground, or with appropriately placed concrete footings, and/or may require sandbags for ballast, as determined by the Inspector and/or Project Manager.
3. Chain link fencing shall be free from barbs, icicles or other projections resulting from the galvanizing process, and shall be knuckle-knuckle. Fence fabric having such defects will be rejected even though it has been erected.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

4. Gates shall be fabricated of steel pipe with welded corners, and horizontal and diagonal bracing as required to prevent flexing. Fabric to be attached to the frame at 12 inch centers. Provide all gate hardware of a strength and quality to perform satisfactorily until the barricade is removed upon completion of the work. Provide locks sufficient to secure the area, and that can be opened with one hand (e.g. combination locks).
 5. At the completion of the work, remove barricade and concrete post footings from the site; backfill and compact fence footing holes by patching with like materials. Existing surface paving that is cut into or removed shall be patched and sealed to match the surrounding areas with like materials, and in the same finishes.
 6. Contractor shall maintain all fencing and gates in good order on a daily basis, including the masking of graffiti as deemed necessary by the Inspector, and/or Project Manager, and shall secure the project fencing and gates at the end of every work day.
- D. Other Enclosures:
1. Provide temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, and/or to allow for temporary heating and for necessary security.
 2. Provide protective barriers that shall be at least 4' in height, and extend to protect all areas at tree drip lines, around plants and other improvements designated to remain, as determined by the Inspector and/or Project Manager and related specification sections.
- E. Storage Yards and Storage Containers:
1. The Contractor shall fence and maintain storage yards in an orderly manner.
 2. Provide steel storage containers, lockable, free from graffiti, and in good condition for materials and equipment that cannot be stored offsite or in a bonded and agreed-upon warehouse.
 3. Exact location, size and access of storage yards and steel storage containers shall be approved by the District Construction/Project Manager.
 4. Remove storage yards and containers as rapidly as progress of the work will permit.

1.04 HARD HAT SIGN

- A. Contractor shall post a sign at each gate and/or entry to any area of construction, identifying the job site as a "hard hat area". No person without a hard hat shall be allowed in the sections of the project under construction. This shall be the responsibility of the Contractor's Project Safety Inspector to enforce.

1.05 DUST AND NOISE CONTROL

- A. Throughout the entire construction period, Contractor shall maintain dust control by use of water or other environmental controls as may be approved by the Architect, Inspector, and/or Project Manager.
- B. Noise Control: Muffle all equipment to a maximum of 85 Dba at 5' from equipment. Noise control is to be kept to a minimum to perform the operations of construction. NO Radios or projected sound will be allowed on the job site.

1.06 GENERAL ITEMS

- A. Staging areas for delivery of materials and equipment will be at locations designated by the drawings and specifications, and/or as approved by the Architect, Inspector, and/or Project Manager.
- B. Safety and Security Lighting: Provide 5 foot candles outside.
- C. Noise Control: Muffle all equipment to a maximum of 85 Dba at 5' from equipment.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Protection for Products, including District - Provided Products, After Installation.
- B. Protection of Existing Utilities and Interference.

1.02 EXISTING UTILITIES

- A. The known existing utilities are shown on the drawings in their approximate location and the Prime Trade Contractor shall exercise care in avoiding damage to these facilities as the Prime Trade Contractor will be held responsible for their repair if damaged. Hand excavation shall be utilized when digging in close proximity to existing utilities. The District's Architectural Team does not guarantee that all utilities or obstructions are shown or that the locations indicated are accurate.
- B. No work shall be performed on energized electrical equipment unless scheduled with the District Inspector of Record. The District Inspector of Record reserves the right to specify specific conditions for all work involving energized high voltage electrical equipment, and its scheduled modification proposal.
- C. If interferences occur at locations other than the general locations shown on the plans, and such utilities are damaged before their locations have been established, or create an interference, the Prime Trade Contractor shall notify the District's Construction/Project Manager and a method for correcting said interference shall be supplied by the District's Engineering representatives. Payment for additional work due to interferences not shown on the plans shall be in accordance with the General Conditions.
- D. Drawings showing location of equipment, piping, etc., are diagrammatic and job conditions will not always permit their installation in location shown. When this situation occurs, bring to the District Architect's, and/or Inspector's attention immediately to determine relocation in joint conference.
- E. Information shown relative to existing power and signal service is based upon available records and data but shall be regarded as approximate only. Minor deviations found necessary to conform to actual locations and conditions shall be made without extra cost to the District.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PROTECTION AFTER INSTALLATION

- A. Adequately protect all installed equipment and materials until completion and acceptance by the Architect, Inspector, and Project Manager.

- B. Protect installed products and control traffic in immediate area to prevent damage in subsequent operations.
- C. Provide protective coverings at walls, projections, corners, and jambs, sills, and stiff openings in and adjacent to traffic areas.
- D. Cover walls and floors of elevator cabs, and jambs of cab doors, when elevators are used by construction personnel. Protect elevator area until final acceptance.
- E. Protect finished floors and stairs from dirt, wear, and damage:
 - 1. Secure heavy sheet goods or similar protective materials in place, in areas subject to construction foot traffic, and/or material deliveries.
 - 2. Lay planking or similar rigid materials in place, in areas subject to movement of heavy objects over existing surfaces.
 - 3. Lay planking or similar rigid materials in place in areas where storage of products will occur.
- F. Protect waterproofed and roofed surfaces:
 - 1. Restrict use of surfaces for traffic of any kind, and for storage of products.
 - 2. When an activity is mandatory, obtain recommendations for protection of surface from manufacturer. Install protection and remove on completion of activity. Restrict use of adjacent unprotected areas.
- G. Restrict traffic of any kind across planted lawn and landscape areas through the use of temporary barricades, fencing, signage, and until final acceptance and maintenance period.
- H. Care shall be exercised to prevent damage to adjacent facilities including walks, curbs, and gutters, etc. Where equipment will pass over these obstructions, suitable planking and protection shall be placed, and damaged facilities, due to the Contractor(s) operations, shall be removed and replaced at the Prime Trade Contractor's expense.
- I. Prime Trade Contractor shall be responsible for overloading of any part or parts of structures beyond their safe calculated carrying capacities by placing of materials, equipment, tools machinery or any other item thereon.
- J. All existing improvements and facilities shall be protected from damage of any type resulting from the operations, equipment or workers of the Contractor(s) during the time the project.
- K. All damaged work shall be replaced, repaired and restored to its original condition with no additional cost to the District.

- L. Where existing utilities are damaged or disrupted on account of any act, omission, neglect or misconduct by the Contractors in the manner or method of executing the work, or due to non-execution of work, such damage shall be immediately repaired to maintain operation regardless of the time of occurrence with no cost to the District.
- M. Provide temporary construction necessary for protection of the building and their parts. Close buildings as soon as possible as protection from the weather and vandalism. Protect existing buildings and controlled temperature areas from excessive temperature variances below 68 degrees Fahrenheit, and above 76 degrees Fahrenheit, and from any damage.
- N. Protect doors, millwork and mill counters and cases and hardware from damage, including abrading and scratching of finishes.
- O. Protect doors and frames and hardware from mechanical damage and damage to finish coatings.
- P. Remove protective coatings, wrappings, temporary coverings, etc., as required to leave work in condition for painting and finishing, final cleaning, etc.
- Q. Protect all exterior work, including existing asphalt paving, concrete flatwork, common sidewalk, and City curb, gutter, and aprons. Protect all existing and newly placed landscaping and irrigation systems.
- R. Repair or replace all damaged work promptly as directed by District Construction/Project Manager, District IOR, or District Architect at no cost to the District.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Security Program.
- B. Entry Control.
- C. Personnel Identification.
- D. Miscellaneous Restrictions

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 SECURITY PROGRAM

- A. Protect work, existing premises, and School operations from theft, vandalism and unauthorized entry.
- B. Security of the job area shall be strictly maintained. The Prime Trade Contractor shall be responsible for keeping areas involved in the work locked and secure at all times when work is not in progress, and no Contractor representative is on site.

3.02 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities under construction. Allow entrance only to authorized persons with proper identification, and appropriate footwear, and hard hats, as determined by the Contractor Project Safety Inspector, and/or District Inspector.
- B. Prime Trade Contractor shall control entrance of own persons and vehicles related to construction operations in accordance with the conditions during work, and not allow intrusion by others.

3.03 BADGES AND ESCORT REQUIREMENTS

- A. All personnel shall wear badges distinguishing personnel requiring an escort (YELLOW badges) to areas of the campus outside of the work area from those not requiring an escort (GREEN badges).
- B. Personnel without fingerprint and acceptable background check on file with the District shall require an escort to any area outside of the work area.
- C. The Contract and Pre-Construction meeting wording lays out the appropriate procedures for Contractor and Subcontractor personnel in working on the school site.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Environmental Mitigation requirement for this project is recorded in this Specification Section 01 56 40. The measures mitigations may include, but are not limited to, procedures and standards to control:
 - 1. Dust
 - 2. Noise
 - 3. Fumes
 - 4. Timing of work activities
 - 5. Erosion
 - 6. Archaeological resources found during excavation
 - 7. Preservation of trees
 - 8. Demolition process and materials.

1.02 EXECUTION

- A. The Contractor shall comply with the mitigation below in terms of what is to be controlled, acceptable methods, and standards (e.g. equipment must be muffled and noise levels may not exceed specified decibel levels).
- B. The Contractor shall provide documentation of having met the mitigation requirements as described below to the Inspector and/or Project Manager within five (5) working days of the Notice to Proceed and at each phase of the project.
- C. To reduce dust emissions and noise during construction by implementing the following:
 - 1. Exposed surfaces should be watered twice daily.
 - 2. Stockpiles of excavated materials should be covered.
 - 3. Trucks carrying excavated materials from the site should be covered and should have their tires and undercarriages washed prior to exiting the site.
 - 4. Streets affected by fugitive sand and dust are to be swept regularly by Prime Trade Contractors responsible for tracking of mud and/or sand to these streets.
 - 5. Uncovered soil should be bound (by grass or similar groundcover) as soon as is reasonably possible.
 - 6. Excavation should not be conducted when surface winds exceed 11 mph.
 - 7. Unnecessary idling of construction vehicles and equipment should be avoided adjacent to areas of instruction, or adjacent to fresh air ductwork, or where noise will affect the areas of instruction.
 - 8. Limit construction activities to a schedule that minimizes disruption as much as possible to area residences surrounding the project site property boundaries.
 - 9. Schedule activities with the highest noise potential for the times when disruption of any instruction, or area of residences surrounding the project site will be at a minimum.

10. Require contractors to employ the lowest-decibel level equipment, or employ alternative equipment or to muffle/control noise from available equipment to the maximum extent possible.
11. Perform noisy operations (e.g., mixing concrete, hydraulic/mechanical demolition) off-site or on portions of the site furthest from noise sensitive receptors whenever possible, and in consult with the Inspector and/or Project Manager.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Surveying and Field Engineering Services.

1.02 QUALITY CONTROL

- A. Land Surveyor: Registered in the State of California and acceptable to the District's Architect, Inspector, and/or Project Manager.

1.03 LINES AND GRADES

- A. The Contractor shall provide all construction survey work required for the accurate location of the work. Horizontal and vertical control for the work shall be from the project reference marks as shown on the Drawings. In all questions arising as to the proper location of the work, the District's A&E teams, and the Inspector's decision shall be final.
- B. The Contractor shall verify final configuration of the project during demolition work. Minor adjustments of the work to accommodate existing field conditions shall be the responsibility of the Contractor.
- C. Replace, at no increase in Contract Sum, control points which may be lost or destroyed; base requirements on original survey control.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify locations of survey control points prior to starting work. Promptly notify District Architect and Inspector of any discrepancies discovered.

3.02 SURVEY REFERENCE POINTS

- A. Protect survey control points prior to starting site work; preserve permanent reference points during construction. Make no changes without prior written notice to the Architect and Inspector.
- B. Promptly report to the Architect and the Inspector the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated survey points based on original survey control.

3.03 SURVEY REQUIREMENTS

- A. Establish a minimum of three (3) permanent bench marks on site, referenced to establish control points. Record locations, with horizontal and vertical data, on Project Record Documents.

- B. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements, including pavements; stakes for grading, fill and topsoil placement; and utility locations, slopes and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, and ground floor elevations.
 - 4. Controlling lines and levels required for mechanical and electrical work.
 - 5. Verify layouts as Work proceeds to assure compliance with required lines, levels and tolerances.
- C. Periodically certify layouts by same means, with same approvals by the Architect and Inspector.

3.04 RECORDS

- A. Maintain a complete and accurate log of all control and survey Work as it progresses.
- B. On completion of foundation walls and major site improvement, including underground utilities, prepare a certified survey showing all dimensions, locations, angles, and elevations of construction to the Architect and Inspector for review and approval of the final survey for the Project record.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES.

- A. Maintain premises and adjacent public and private properties free from accumulations of waste, debris, and rubbish, caused by operations during the project.
- B. At completion of Work, remove waste materials rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces; leave project clean and ready for occupancy.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Use only cleaning materials recommended by the manufacturer of surface to be cleaned.
- B. Use cleaning materials only on proper surfaces recommended by the manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION:

- A. Execute daily cleaning plans from each trade to ensure that buildings, grounds, and public and private properties are maintained free from accumulations of waste materials, rubbish and trash on a daily basis.
- B. Wet down dry materials and rubbish to prevent blowing dust and debris on and from the construction work.
- C. Daily, during progress of work, clean construction site and utilized public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site steel dump containers and appropriately sized trash containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off the District's property.
- F. Vacuum clean and wet wipe interior building walls, floors, doors, windows, and hardware in preparation for and when ready to receive finish preparation and painting. Continue vacuum cleaning on an as-needed basis until building is ready final inspection by the Architect, Inspector, and Project Manager and determined to be ready for substantial completion and occupancy.

- G. Handle materials in a controlled manner to minimize any unnecessary waste or debris emanating from the construction areas. Do not drop or throw materials from heights: rather, a closed chute shall be used, to minimize unnecessary dust, waste or debris from the construction area.
- H. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not migrate into new equipment or furniture, or onto wet, newly painted surfaces.

3.02 FINAL CLEANING:

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. Exterior: Clean surfaces of the construction and site including, but not limited to, fixtures, walls, soffits, floors, hardware, roofs, window and opening ledges and sills, horizontal projections, steps and platforms, walkways, rails and all like surfaces, and adjoining private and public property to the extent soiled by the Contractor's operations.
- C. Interior: Leave all horizontal and vertical surfaces in vacuum cleaned, wet-wiped condition with all dust, dirt, stains, hand marks, paint spots, droppings, and other blemishes and defects completely removed, and conform to the following requirements:
 - 1. Hard Floors: Freshly administer specified product sealants, and Wet mop/wash and dry, concrete, portland cement flooring, tile, elastomeric, epoxy, refinished and colored concrete, and similar hard floor surfaces free of dust, streaks or stains.
 - 2. Resilient Flooring: Freshly wax and buff as specified in Section 09650.
 - 3. Wood Flooring: Remove defects and blemishes by sanding surface and painting according to Section 09900.
 - 4. Resilient Bases: Clean off adhesive smears and wipe clean with wet-wipe methods.
 - 5. Unpainted and Painted Surfaces: Clean of dust, lint, streaks or stains, utilizing wet-wipe methods as necessary.
 - 6. Tile Walls: Clean and polish per manufacturer's specifications.
 - 7. Hardware and Metal Surfaces: Clean and polish all exposed surfaces using non-corrosive and nonabrasive materials.
 - 8. Glass: Wash and polish both sides, and leave free of dirt, spots, streaks, and labels. Clean and polish mirrors.
 - 9. Ceilings: Clean and free of stains, hand marks, and defacing.
 - 10. Replace air conditioning filters as specified in Mechanical Specifications.
 - 11. Clean ducts, blowers and coils, if air conditioning units were operated without filters during construction, and after final inspection.
 - 12. Lighting fixtures: Replace lamps and clean fixtures and lenses if fixtures or lamps are dirty or have smudges or dust.

13. Fixtures and Equipment: Clean and polish mechanical and electrical fixtures and like items. Leave lighting fixtures free of dust, dirt, stains or waste material. Clean and service equipment and machinery, leaving ready for use.
 14. Surfaces Not Mentioned: Clean according to the intent of this Section and as required for Architect's approval.
- D. Contaminated Earth: Final clean-up operation includes the removal and disposal of earth that is contaminated or unsuitable for support of plant life in planting areas, and filling the resulting excavations with suitable soil as directed and approved by the Architect, Inspector, and/or Project Manager.

Contaminated areas include those used for disposal of waste concrete, mortar, plaster, masonry, paints, and similar materials, and areas in which washing out of concrete and plaster mixers or washing of tools and like cleaning operations have been performed, and all areas and adjacent areas that have been oiled, paved, or chemically treated.

Do not dispose of waste, oil, solvents, paints, solutions, or like penetrating material by depositing or burying on School property; dispose of such material in a lawful manner.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for closing-out Project.

1.02 RELATED SECTIONS

- A. Closeout Submittals: See Respective Specification Sections.

1.03 GENERAL

- A. As a prerequisite for final payment release, Contractor shall complete the work of this Section.
- B. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

1.04 PRE-FINAL INSPECTION; SUBSTANTIAL COMPLETION

- A. Pre-final Inspection:
 - 1. Upon "substantial completion" of the Work AS AGREED TO BY Contractor, Architect/Engineer, DSA Inspector of Record and District Project Manager, Contractor shall notify Architect/Engineer, and DSA Inspector and request a "pre-final inspection" of the Work.
 - 2. If Architect/Engineer, Inspector, and Project Manager concur that work of the contract project/phase is "substantially complete", he will review and list any items that need to be corrected on a punch list. List will be amended as required to include items on the correction or punch list subsequently observed.
- B. Substantial Completion Defined: "Substantial Completion" of the Work is the status, as approved by the Architect/Engineer when construction is sufficiently complete, in accordance with the Contract Documents, so the District/Owner can occupy or utilize the Work for the use for which it is intended.

1.05 FINAL INSPECTION

- A. Reference: See Supplementary Conditions.
- B. Final Inspection: When Contractor has complied with above Article at the end of the final phase, Architect/Engineer and DSA Inspector and Project Manager will review the Work and list any items that are not completed or need to be corrected.
- C. Contractor shall complete and/or correct the Work in a timely manner as outlined in the contract documents.

1.06 GUARANTEES

A. General: Contractor shall guarantee in writing to District/Owner that:

"Contractor will repair or replace any or all of such work, together with any other adjacent work which may be displaced in connection with such replacement, that may prove to be defective in workmanship or material within a period of one year from the date of acceptance of the above mentioned structure by the Glendale Unified School District, ordinary wear and tear, and unusual abuse or neglect excepted."

B. Format: Contractor shall submit guarantees typed in the format indicated in "Guarantee Form".

C. Number of Copies: Submit in triplicate (3) to Architect/Engineer with one electronic pdf.

D. Required Guarantees:

1. General: Submit all guarantees listed herein or required by various Spec. Sections.

2. General Guarantee:

a. By General Contractor; For the Entire Work: 1 Year.

3. Specific Guarantees:

<u>SPEC DIVISION</u>	<u>ITEM</u>	<u>TIME PERIOD</u>
a. Division 6	Custom Casework	2 Years
b. Division 7	Built-up Roofing	10 Years
	All Flashing & Sheet Metal, in connection with roof coverings	5 Years
	All Joint Sealants	5 Years
	Damp proofing	2 Years
c. Division 8	Hollow Metal Doors & Frames	2 Years
	Wood Doors	Lifetime
d. Division 9	Acoustical Ceiling Systems	2 Years
e. Division 10	Porcelain Enamel Liquid Marker Board Surfaces	Lifetime
	Toilet Compartments	Lifetime
	Operable Walls	3 Years
	Toilet Accessories	1 Years
f. Division 11	Equipment Projector Screen	1 Years
	Laboratory Equipment and Cabinets	Lifetime
g. Division 12	Furnishings Vertical Blinds	Lifetime
h. Division 14	Hydraulic Elevator	1 Year
	Wheelchair Lift.....	1 Year

- I. Division 22 Plumbing 1 Year
HVAC Systems 1 Year
Temperature Controls for
HVAC Systems 1 Year
- j. Division 26 All Electrical Work 1 Year

1.07 WARRANTIES

- A. General: Comply with Section 017836. Submit all warranties required by various Specification Sections.

1.08 CERTIFICATES

- A. General: Submit in triplicate (3) all certificates required by various Specification Sections or listed herein, notarized as required.
- B. Certificates:
 - 1. Division 8: Finish Hardware installation acceptance.
 - 2. Division 28: Fire Alarm System testing and approval.

1.09 OPERATION AND MAINTENANCE DATA

- A. General: Submit all manuals required by various Specification Sections or listed herein; three (3) copies each, and one electronic pdf. Provide durable binders, no less than 8-1/2" x 11" in size and provide the following information:
 - 1. Identification on, or readable through, the front cover stating general nature of the manual.
 - 2. Neatly typewritten index at the front of the Manual, furnishing immediate information as to location in the Manual of all data or equipment included.
 - 3. Complete instructions regarding operation and maintenance of all equipment included.
 - 4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.
 - 5. Copy of all Guarantees and Warranties issued.
 - 6. Copy of the approved Shop Drawings with all data concerning changes made during construction.
- B. Extraneous data: Where contents of Manuals include Manufacturers' catalog pages, clearly indicate the precise items included in this installation by clouding, or highlighting, and delete, all manufacturers' data with which this installation is not concerned.

1.10 RECORD DRAWINGS

- A. Procedures:
 - 1. Promptly following contract award, General Contractor shall secure from the District one complete set of Drawings. Identify the set as "Record."
 - 2. Timing of Entries: Make entries within 24 hours after receipt of information on any changes by Contractor or Sub Contractors.

3. Contractor shall be responsible for maintaining and recording the changes on the set, and by affixing any related RFI, COR, and/or ASI applicable to the changes.
4. Do not use the "Record" set for any purpose except entry of new data and for review by the Architect. Maintain separate job sets for subcontractors and workers daily use.
5. Maintain the "Record" set at the job site where designated by the Architect/Engineer, in conjunction with the DSA Inspector.
6. Use all means necessary to protect the "Record" set from deterioration, loss or damage until completion of the work.
7. Making entries on Drawings: Using an erasable colored pencil, other than blue or black, not ink or indelible pencil, and clearly describe the change by note and by graphic line as required. Date all entries. Call attention to the entry by a "cloud" around the area or areas affected. In the event of overlapping changes, different colors may be used for each of the changes.
 - a. Changes due to approved change orders may be indicated by referencing the change order number and scope of change in lieu of revising the Drawings.
 - b. The location and depth below finish grade or above ceilings and attic spaces of utilities shall be fully dimensioned and indicated on Drawings. Dimensions shall be taken to building lines or permanent landmarks.
8. The architect's approval of the current status of the "Record" drawings will be a prerequisite to the Architect/Engineer's and DSA Inspector's approval of requests for progress payments and request for final payment release.
 - a. Progress approvals: Prior to submitting each request for progress payments, secure the District DSA Inspector's approval of the status of the "Record" Drawings.
 - b. Prior to submitting request for final payment and final inspection, General Contractor shall submit the "Record Drawing" set to the District DSA Inspector, with transmittal letter, in duplicate, for approval and further processing through the Architect/Engineers for their approval and acceptance, and delivery to the District.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUBMITTAL REQUIREMENTS:

- A. Assemble Warranties, Bonds, and Service and Maintenance Contract, executed by each of the respective Manufacturers, Suppliers, and Subcontractors, and submit to the Architect/Engineer for review and approval before Final Payment will be approved and released.
- B. Number of original signed copies required: Three (3) each and one electronic pdf.
- C. Table of Contents Neatly typed in orderly sequence.
- D. Provide complete information for each item:
 - 1. Product or work Item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Beginning date of Warranty, Bond, or Service and Maintenance Contract.
 - 4. Duration of Warranty, Bond of Service, and Maintenance Contract.
 - 5. Provide the following information for District/Owner's Personnel:
 - a) Procedure in case of failure or malfunction.
 - b) Instances which affect Warranty or Bond validity.
 - 6. Contractor, name of responsible principal, address, telephone number and email address.

1.02 SUBMITTAL FORM:

- A. Punch sheets for standard 3-ring binder.
- B. Size: 8-1/2 x 11 inches.
- C. Fold larger sheets to fit into binder.
- D. Cover: Identify each packet with typed or printed title 'WARRANTIES AND BONDS' 1st:
 - 1. Title of Project.
 - 2. Name of Contractor.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Includes:
 - 1. Remove designated Trees, Landscape, and items on Drawings.
 - 2. Remove excavated debris and spoils from site.
 - 3. Refer to Drawings for additional Scope of Work.
- B. Related Work:
 - 1. Requirements in Addenda, Alternates, Conditions and Division 1 collectively apply to this work.

1.02 QUALITY ASSURANCE

- A. Demolition shall be in compliance with Title 24 of the California Code of Regulations and conform to the California Building Code, current edition.
- B. Utilities disconnection, capping and re-installation shall be by workmen licensed to perform such work.

1.03 SUBMITTALS

- A. Two (2) copies of permits and notices.
- B. Upon completion of work in this Section, submit record documents recording the extent of active and abandoned underground utilities.

1.04 EXISTING CONDITIONS

- A. Contractor shall contact the local underground service alert company for information on buried utilities and pipelines.
- B. Conduct demolition to minimize interference with adjacent structures, trees and properties.
- C. Provide, erect and maintain temporary barriers and security devices.
- D. Conduct operations with minimum interference to public or private thoroughfares. Maintain egress and access at all times.
- E. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

- F. Prior to demolition or heavy vehicular activity, examine structures adjacent to the designated demolition, including concrete walks and asphaltic concrete paving. Obtain District Inspector's confirmation by signature for the following:
 - 1. Record on the Project Record Documents any pre-existing conditions that could later be construed as Contractor damage.
 - 2. Document each recorded pre-existing condition with a supporting photograph.
- G. Protection of Existing Utilities: Protect existing utilities, including irrigation system from damage.
 - 1. Contact the local underground service alert company and the District prior to any trenching for determining location of underground utilities/irrigation lines.
 - 2. Contact the District for repair instructions for damaged lines.
 - 3. REPAIR OF HIDDEN DAMAGED PRODUCTS, DISCOVERED BY THE DISTRICT, WILL BE CHARGED DIRECTLY TO THE CONTRACTOR.
- H. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements not indicated to be demolished and/or removed.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
- I. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
 - 1. Water trees and other vegetation to remain within limits of Contract Work as required to maintain their health during course of construction operations.
 - 2. Replace damaged trees that are damaged by construction activities.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify that structures to be demolished are unoccupied and discontinued in use.
- B. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

- C. Protect existing landscaping materials, appurtenances and structures, which are noted to remain.
- D. Notify School maintenance personnel and utility authorities to locate and flag underground lines. Disconnect, remove and cap designated utility lines within demolition areas. Obtain release from respective utility companies that utilities have been capped in a safe manner.
- E. Mark location of disconnected utilities. Identify utilities and indicate capping locations on project record documents.

3.02 EXECUTION

- A. Remove excavated turf and soil/rocks in association with the installation of the new work. Dispose of rocks and excavated debris to off-site dump. Top soil shall be stockpiled/relocated to another District Site or spread on-site in accordance with District's wishes at each indicated site.
- B. Asphaltic concrete paving shall be saw cut to a straight line on the demolition border, prior to paving demolition.
- C. Cease operations and notify Architect immediately if adjacent structures appear to be endangered. Do not resume operations until corrective measures have been taken.
- D. Remove and promptly dispose of contaminated, vermin infested or dangerous materials encountered.
- E. Do not burn or bury materials on Site.
- F. Keep work sprinkled to minimize dust. Provide hoses and water main or hydrant connections for this purpose.

3.03 SITE CLEARING

- A. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction. Saw cut existing paving at boundary of areas to be removed.

3.04 DISPOSAL OF WASTE MATERIALS

- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
- B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Remove designated building equipment and fixtures.
- B. Identify and cap discontinued utilities including underground utilities.
- C. Carefully demolish and remove from the Site those items scheduled to be so demolished and removed. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the Contract, including, but not limited to, the following items:
 - 1. Protection of existing items to remain.
 - 2. Barricades, lights, signs and safety precautions required by the governing code.

1.02 RELATED WORK

- A. Documents affecting work of this Section include, but are not limited to, General Conditions, Supplementary Conditions, and Division 1 of these Specifications.
- B. Relocation of utility lines and mechanical structures scheduled to remain active.
- C. Building Demolition: Section 02 41 16.

1.03 GENERAL REQUIREMENTS

- A. Codes: Perform Work in accordance with appropriate Codes, and California Fire Code, latest edition, "Article 87 - FIRE SAFETY DURING CONSTRUCTION, ALTERATION, OR DEMOLITION OF A BUILDING."
- B. Examine the Site, conditions, and limitations thereon and thereabouts. Bidding shall take into account such conditions and limitations, whether or not the same are specifically mentioned in the Contract Documents, and every bid shall be construed as including whatever sums are needed to complete the Work in every part as shown, described, or reasonably required or implied, and attain the completed conditions contemplated by the Contract. The demolition drawings, including demolition work shown on construction drawings, shall be considered as a guide only. The exact extent of the demolition and reconstruction work shall be determined by a site visit and investigation.
- C. Make note of existing asbestos, including asbestos lined pipes, ductwork and equipment. Removal of asbestos shall be executed by Contractor. Coordinate Work with trades contracted by Owner to execute the asbestos removal.
- D. The use of explosives will not be permitted.
- E. Partial Removal: Items scheduled to be removed and of salvageable value to Contractor may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed. Partial removal is subject to the following conditions:
 - 1. Storage or sale of removed items on site will not be permitted.
 - 2. This excludes items and materials to be stored for Owner.
- F. Unforeseen Conditions: Include in the base bid miscellaneous cutting and patching necessitated as a result of unforeseen conditions. No extra payments based on the pleas of unforeseen conditions will be allowed.
- G. Noise control: Carry on work in a manner which will produce the least amount of noise. Instruct workmen in noise control procedures.
- H. Removal of abandoned lines, vaults, the erasing of easements, and similar work is a responsibility of the local governmental authority having jurisdiction.

- I. Conduct demolition to minimize interference with adjacent building areas. Maintain protected access at all times.
- J. Provide and erect temporary barriers and security devices.

1.04 QUALITY ASSURANCE

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.05 SUBMITTALS

- A. Schedule: Submit proposed methods and operations of building demolition to Architect for review prior to start of Work. Include in schedule, coordination for shut-off, capping, and continuation of utility services, as required.
- B. Submit five (5) copies of demolition and removal procedures and schedule for Architect's review.
- C. Upon completion of the work in this Section, submit Record Drawings recording the extent of active and abandoned underground utilities. The drawings shall be signed and dated by the Contractor and shall be drawn on reproducible sepia. Submit drawings to Inspector of Record and/or transmittal to Architect.

PART 2 - PRODUCTS

2.01 SALVAGE CONTAINER

- A. Provide one (1) lockable steel container, 8' x 8' x 20'.
- B. Place container where directed by District.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Site Security: Erect chain link fence barricades, warning lights, and signs as required by the governing building code, to protect persons from injury, to prevent trespassing, and to prevent theft or damage due to vandalism.
- B. Erect weatherproof closures for exterior openings as specified in Section 01 50 00.

- C. Notify utility authorities to locate and flag underground lines. Disconnect, remove, and cap designated utility services within demolition areas.
- D. Mark location of disconnect utilities. Identify and indicate capping locations on Project Record Documents.
- E. Avoid cutting existing pipe, conduit, or ductwork serving the building but then scheduled to be removed or relocated until provisions have been made to bypass them.
- F. Protect landscaping and irrigation systems unless scheduled to be altered.
- G. Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
 - 1. Erect temporary covered passageways as required by authorities having jurisdiction.
 - 2. Provide interior and exterior shoring, bracing, or support as required to prevent movement, settlement, or collapse of building structure to remain.

3.02 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.03 DEMOLITION

- A. By careful study of the Contract Documents, determine the location and extent of selective demolition to be performed.
- B. In company with the Architect, visit the Site and verify the extent and location of selective demolition to be performed.
 - 1. Carefully identify limits of selective demolition.
 - 2. Mark interface surfaces as required enabling workmen to identify items to be removed and items to be left in place intact.

- C. Prepare and follow an organized plan for demolition and removal of items.
 - 1. Shut off, cap, and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction. Review plans, and confer with the Architect, to determine which lines are to be abandoned and which are to be kept active.
 - 2. Completely remove items scheduled to be demolished and removed.
 - 3. Comply with pertinent regulations of governmental agencies having jurisdiction.
- CI. Demolished material shall be considered to be property of the contractor and shall be completely removed from the job site. Burning of removed materials from demolished structures will not be permitted on Site.
- CII. Demolish in an orderly and careful manner. Protect existing supporting structural members and finishes which are not to be demolished. Unless shown on the Drawings, no structural elements such as rafters, joists, columns, or studs shall be cut without written permission from the Architect and Division of the State Architect (DSA).
- CIII. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.

3.04 POLLUTION CONTROLS

- A. Use water sprinkling, temporary enclosures and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
 - 1. Do not use water when it may create hazardous or objections such as ice, flooding, and pollution.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to start of Work.

3.05 TRAFFIC

- A. Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
- B. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

3.06 UTILITY SERVICES

- A. Maintain existing utilities; keep in service, and protect against damage during demolition operations.
- B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- C. Owner will shut-off utilities serving structures. Disconnecting and sealing indicated utilities before starting demolition operations is part of this work.
- D. Locate and protect those irrigation devices which are to remain in use and not be replaced or relocated within the area of demolition or workers' vehicular traffic throughout the entire period of the Project.
- E. Buildings that house public address systems and fire alarm, typically in Administration Buildings are to have power maintained at all times. If power must be interrupted, Contractor must give two (2) weeks prior notice for approval and schedule with District for interruption over weekends or when school is not in session.

3.07 REPLACEMENTS

- A. In the event of demolition of items not so scheduled to be removed and/or replaced, promptly replace such items to the acceptance of the Architect and at no additional cost to District.
- B. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no additional cost to District.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
- B. Openings for other affected work.
- C. Form accessories.
- D. Stripping forms.

1.02 REFERENCES

- A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 19A.
- B. ACI 301 - Specifications for Structural Concrete for Buildings.
- C. PS 1-09 - Structural Plywood.

1.03 SYSTEM DESCRIPTION

- A. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

1.04 QUALITY ASSURANCE

- A. Construct and erect concrete formwork in accordance with ACI 301.

1.05 REGULATORY REQUIREMENTS

- A. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

- A. Plywood: PS1-09, BB Ply form grade, Class I, Exterior classification.
- B. Lumber: douglas fir species; construction grade; with grade stamp clearly visible.

2.02 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off metal of adjustable length; cone type; 1 inch break back dimension; free of defects that will leave holes no larger than one inch diameter in concrete surface.
- B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- C. Fillets for Chamfered Corners: Wood strips type; 3/4 x 3/4 inch size; maximum possible lengths.
- D. Nails, Spikes, Lag Bolts, Through Bolts, and Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Verify lines, levels, and measurements before proceeding with formwork.

3.02 PREPARATION

- A. Obtain Architect's approval for use of earth forms for footings.
- B. Minimize form joints. Symmetrically align joints and make watertight to prevent leakage of mortar.
- C. Arrange and assemble formwork to permit stripping, so that concrete is not damaged during its removal.
- D. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3.03 ERECTION

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- C. Provide chamfer strips on external corners of walls.
- D. Obtain approval before framing openings in structural members which are not indicated on Drawings.
- E. Do not displace or damage vapor barrier placed by section 03 30 00.
- F. Construct formwork to maintain tolerances in accordance with ACI 301.

3.04 APPLICATION OF FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
- B. Do not apply form release agent where concrete surfaces are scheduled to receive applied coverings which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.05 FORM REMOVAL

- A. Do not remove forms and bracing until concrete has sufficient strength to support its own weight and imposed loads.
- B. Do not damage concrete surfaces during form removal.
- C. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.
- D. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

3.06 CLEANING

- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean-out ports.

3.07 EARTH FORMS

- A. Construct wood edge strips at top sides of excavations as indicated on drawings.
- B. Provide forms for footings and foundation walls wherever concrete cannot be placed against solid earth.
- C. Remove loose dirt and debris from form area prior to concrete placement.
- D. Concrete for foundations may be placed directly into neat excavations provided the foundation trench walls are stable as determined by the Architect (Structural Engineer) and subject to approval of the Division of the State Architect.
- E. When earth formed foundations are used, the minimum formwork shown on the drawings is mandatory to insure clean excavations prior to and during concrete placement.
- F. Provide 3-1/2 inch high starter wall for all concrete and masonry walls below grade.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel bars, welded steel wire fabric fabricated steel bar or rod mats for cast-in-place concrete.
- B. Support chairs, bolsters, bar supports, and spacers, for supporting reinforcement.

1.02 REFERENCES

- A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 19A (ACI 318).
- B. ACI 301 - Specifications for Structural Concrete for Buildings.
- C. ACI 315 (SP-66) - Details and Detailing of Concrete Reinforcement.
- D. ACI 318 - Building Code Requirements for Structural Concrete.
- E. ASTM A1064 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- F. ASTM A615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- G. ASTM A706 - Standard Specification for Low Alloy Steel Deformed Bars for Concrete Reinforcement.
- H. ASTM C1116 - Specification for Fiber-Reinforced Concrete and Shotcrete.
- I. AWS D1.4 - Structural Welding Code Reinforcing Steel.
- J. CRSI - Manual of Practice.
- K. CRSI - Placing Reinforcing Bars.

1.03 QUALITY

ASSURANCE Bonita High

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Gym HVAC

Replacement File 19-H3

03-122102

- A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice.
- B. Conform to ACI 301 and ACI 315 (SP-66).
- C. Conform to CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

1.04 CERTIFICATES

- A. Submit mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel: ASTM A615, Grade 40 for No. 4 bars and smaller, Grade 60 for No. 5 bars and larger. Billet-steel deformed bars, uncoated finish.
- B. Welded Reinforcement: ASTM A706, Grade 60, deformed bars, unfinished.
- C. Welded Steel Wire Fabric: ASTM A1064 plain type; coiled rolls; uncoated finish.
- D. Steel Wire: ASTM A1064, plain, cold drawn steel.

2.02 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete including load bearing pad on bottom to prevent vapor barrier puncture.

2.03 FABRICATION

- A. Fabricate in accordance with ACI 315 (SP-66), providing concrete cover specified in Section 03 30 00.

- B. Locate reinforcing splices not indicated on Drawings at points of minimum stress.
- C. Weld reinforcing bars in accordance with AWS D1.4.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Before placing concrete, clean reinforcement of foreign particles or coatings.
- B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.
- C. Do not displace or damage vapor barrier required by Section 03 30 00.

3.02 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of section 01 45 29 and as required by the Division of the State Architect and District inspector.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place concrete foundation walls, and footings.
- B. Floors and slabs on vapor barrier.
- C. Control, expansion, and contraction joint devices associated with concrete work.
- D. Curing and sealing compound.

1.02 REFERENCES

- A. The 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. CBC - California Building Code, (CCR) California Code of Regulations Title 24, Part 2, Chapter 19A.
- C. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- D. ACI 301 - Specifications for Structural Concrete for Buildings.
- E. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
- F. ACI 305R - Hot Weather Concreting.
- G. ACI 306R - Standard Specification for Cold Weather Concreting.
- H. ACI 318 - Building Code Requirements for Structural Concrete.
- I. ASTM C33 - Concrete Aggregates.
- J. ASTM C94 - Ready-Mixed Concrete.

- K. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
- L. ASTM C150 - Portland cement.
- M. ASTM C260 – Air entraining admixtures for concrete.
- N. ASTM C289 - Potential Reactivity of Aggregate.
- O. ASTM C309 - Liquid Membrane Forming Compound.
- P. ASTM C330 - Lightweight Aggregates for Structural Concrete.
- Q. ASTM C494 - Standard Specifications for Chemical Admixtures for Concrete.
- R. ASTM C567 - Unit Weight of Structural Lightweight Concrete.
- S. ASTM C618- Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture for Concrete.
- T. ASTM C932 - Surface-Applied Bonding Agents.
- U. ASTM C1315 - Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- V. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- W. ASTM D226 - Asphalt Saturated Organic Felt used in Roofing and Waterproofing.
- X. ASTM D1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction.
- Y. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
- Z. ASTM E154 - Standard Test Methods for Water Vapor Retardants used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

- AA. ASTM E1643 - Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slab.
- BB. ASTM E1155 - Determining Floor Flatness and Levelness Using the F-Number System.
- CC. ASTM E1745 - Standard Specifications for Plastic Water Vapor Retarders Used in Contact with Soil Or Granular Fill Under Concrete Slabs.
- DD. ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
- EE. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- FF. National Ready Mix Concrete Association - Plant Certification Program.
- GG. Stormwater Best Management Practice Handbook (BMP Handbook),

1.03 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Installation of vapor barrier shall be in accordance with ASTM E1643 and manufacturer's installation guides and recommendations. Provide Architect written site reports from manufacturer's field service representative, indicating observation of vapor barrier installation prior to concrete placement.
- C. Obtain concrete materials from same source throughout the Work.

1.04 QUALIFICATIONS

- A. Manufacturer: Manufacturer of ready-mix concrete products complying with ASTM C94 requirements for production facilities and equipment. Certified according to National Ready Mix Concrete Associates Plant Certification Program.

1.05 DESIGN MIX

- A. Submit design mix for each class of concrete, prepared by a

California Registered Civil Engineer, to testing laboratory and architect to review.

1.06 REGULATORY REQUIREMENTS

- A. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.
- B. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, and the 2010 ADA Standards for Accessible Design for access requirements for individuals with disabilities.

1.07 SUBMITTALS

- A. Submit product data and manufacturer's instructions for all accessories under provisions of section 01 33 00.

1.08 PRE-INSTALLATION CONFERENCE

- A. Convene a conference two weeks prior to commencing placement of floor slab work of this section, under provisions of Section 01 31 00.
- B. Require attendance of parties directly affecting the work of this Section.
- C. Agenda:
 - 1. Placement of subgrade beneath floor slab.
 - 2. Testing of subgrade beneath floor slab.
 - 3. Delivery and placement of concrete.
 - 4. Testing and inspection procedures for concrete.
 - 5. Submittal of mix design for concrete.
 - 6. Hot and cold weather concreting procedures.
 - 7. Vapor barrier location and installation.
 - 8. Placement of control and expansion joints.
 - 9. Steel reinforcement installation.
 - 10. Installation of inserts and embedded items.
 - 11. Finishes and finishing.
 - 12. Forming and form removal limitations.
 - 13. Floor slab flatness and levelness requirements.

- 14. Curing process and procedures.
- 15. Protection of finished floor slabs.
- 16. Floor slab joint and crack repair.
- 17. Moisture vapor transmission testing.

1.11 WARRANTY

- A. Provide fifteen year warranty from curing, hardening and vapor barrier compound manufacturer under provisions of Section 01 77 00.
- B. Warranty: Include coverage for removal and replacement of finish floor materials that delaminate from interior floor slabs due to moisture migration and excessive vapor emissions or due to presence of efflorescence and alkali contaminates.
- C. Provide warranty from vapor barrier manufacturer that products meet the current requirements of ASTM E1745 and will be free from material defects for the life of the building.

PART 2 – PRODUCTS

2.01 FORMWORK

- A. As specified in Section 03 11 00.

2.02 REINFORCEMENT

- A. As specified in Section 03 20 00.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I or Type II Portland type; low alkali; grey color.
- B. Fine and Coarse Aggregates Normal Weight Concrete: ASTM C33, non reactive when tested in accordance with ASTM C289 and Appendix X-1 of ASTM C33.
- C. Fine and Coarse Aggregate, Light Weight Concrete: ASTM C330.
- D. Water: ASTM C1602, clean and not detrimental to concrete.

2.04

ADMIXTURES

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Bonita High Gym

HVAC

Replacement

- A. Air Entrainment: ASTM C260.
- B. Fly Ash: ASTM C618, Class F.
- C. Water reducing admixture: ASTM C494, Type A.
- D. Calcium Chloride, or any other admixtures not allowable.

2.05 VAPOR BARRIER

- A. Material: 15 mil thick polyethylene film meeting the requirements of ASTM E1745, Class A, with a maximum permeance of 0.01 perms in accordance with ASTM E96/E154, Section 7, and a Water Vapor Transmission Rate (WVTR) of less than 0.0037 when tested according to ASTM F1249.
- B. Accessories:
 - 1. Minimum 4 inch wide polyethylene seaming tape with pressure sensitive adhesive.
 - 2. Minimum 6 inch wide multi-layered textured polyethylene concrete bonding tape.
 - 3. Polymer-modified liquid vapor retarder mastic.
 - 4. PVC termination bar with pre-drilled holes.
 - 5. All accessories provided by vapor barrier manufacturer.
- C. Manufacturers:
 - 1. Fortifiber Building Products, www.fortifiber.com.
 - 2. Poly-America, www.yellowguard.com.
 - 3. Reef Industries, www.reefindustries.com.
 - 4. Stego Industries, www.stegoindustries.com.
 - 5. Substitutions: Under Provisions of Section 01 25 13.

2.06 ACCESSORIES

- A. Underlayment: ASTM D226, Type I (No. 15) asphalt saturated roofing felt.
- B. Bonding Agent: ASTM C932; Weld-Crete as manufactured by Larsen Products Corp., www.larsenproducts.com.
- C. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 7000 psi in 28 days.
- D. Joint Filler: ASTM D1751, 1/2 inch thick.
- E. Sand Fill: Manufactured "crusher run" sand free of silt, clay, loam, friable or soluble materials or organic matters, all passing the No. 4 sieve and only 5 percent passing the No. 200 sieve.
- F. Curing, Hardening and Vapor Barrier Compound: ASTM C1315, Type I, Class A and ASTM C309, Type 1, Class A, with maximum volatile organic compound (VOC) content rating as required to suit regulatory requirements. Material to have no less than 34 percent penetrating solids, have no visible sheen and be compatible with floor finish materials and overlayers. Provide the following:
 - 1. PMC 3300 Penetrating Sealer manufactured by Curranseal, www.curranseal.com.
- G. Sealing Compound: Ashford Formula manufactured by Curecrete Distribution, Inc., www.ashfordformula.com.
- H. Slip Resistant Aggregate: 95 percent minimum fused homogeneous aluminum oxide.

2.07 CONCRETE MIX

- A. Mix concrete in accordance with ASTM C94 ACI 318, Section 26.4.4.
- B. Footings: Proportion normal-weight concrete mixture as follows:
 - 1. Minimum compressive strength: 3,500 psi at 28 days
 - 2. Maximum Water-Cement Materials Ratio: 0.50
 - 3. Aggregate Size: 1" maximum
 - 4. Slump Limit: 4" minimum, 6" maximum
- C. Slabs-on-grade: Proportion normal-weight concrete mixture as follows:

1. Minimum compressive strength: 4,000 psi at 28 days
2. Maximum Water-Cement Materials Ratio: 0.45
3. Aggregate Size: 3/4" maximum
4. Slump Limit: 3" minimum, 5" maximum

PART 3 – EXECUTION

3.01 INSPECTION

- A. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause difficulty in placing concrete.

3.02 PREPARATION

- A. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.
- B. Place 2 inch thick sand fill over subgrade.
- C. Compact sand fill as specified in Section 31 20 00.
- D. Install underlayment over wood subfloor. Lap joints 6 inches. Fasten in place.

3.03 VAPOR BARRIER

- A. Install vapor barrier in compliance with ASTM E1643 under interior slabs over sand subgrade.
- B. Install vapor barrier to exterior surface of below grade building foundation walls and grade beams. Seal to vertical surface of foundation wall with pressure sensitive tape and termination bar at an elevation consistent with the top of the adjacent finish grade.
- C. Lay vapor barrier with long dimension parallel with long dimension of space.
- D. Lap vapor barrier over footing and seal to vertical surface of interior foundation wall with pressure sensitive tape and termination bar at an elevation consistent with the top of the slab or terminate vapor barrier at horizontal edge of slab. Overlap all joints in vapor barrier 6 inches and seal with tape.
- E. Seal all pipe penetrations of vapor barrier with pipe boot fabricated from vapor barrier material, tape and mastic.

- F. Repair damaged areas with vapor barrier, overlapping damaged area by 6 inches and taping all four sides.

3.04 PLACING CONCRETE

- A. Notify Architect minimum 24 hours prior to commencement of concreting operations.
- B. Place concrete in accordance with ACI 301.
- C. Hot Weather Placement: ACI 305R.
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete in hot weather. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
- D. Cold Weather Placement: ACI 306R.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 306.1
- E. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
- F. Do not disturb or damage vapor barrier while placing concrete. Repair damage as required to maintain integrity of barrier.
- G. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.
- H. Place interior floor slabs on fill in a strip sequence pattern.
- I. Excessive honeycomb or embedded debris in concrete is not acceptable.

3.05 JOINTS

- A. Saw cut control joints at an optimum time after finishing. Use 3/16 inch thick blade, cutting 1/3 into depth of slab thickness.

- B. Review locations of joints when indicated and make recommendations for any additional joints or suggestions for new locations. Lack of joints or misplacement of joints will not constitute justification of slab cracking.
- C. Provide control joints at 15 feet on center unless otherwise indicated.
- D. Where indicated on the drawings, separate slabs from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface.

3.06 FLOOR SLAB JOINT FILLING AND CRACK REPAIR

- A. Prepare, clean, and install joint repair material according to manufacturer's written instructions.
- B. Defer joint filling and crack repair until concrete has aged a minimum of 60 days.
- C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- D. Mechanically V-groove as necessary all saw cuts, joints and cracks, to a minimum width of 1/4 inch and a minimum depth of 5/8 inch.
- E. Fill bottom of joint at slab on grade locations to a depth of at least 3/16 inch with semi-rigid epoxy. Omit semi-rigid epoxy at above grade slab locations.
- F. Place silica sand over epoxy filler.
- G. Prepare and prime joint substrate as recommended by joint repair material manufacturer.
- H. Fill all saw cuts, joints, and cracks with cement based joint repair material to top of concrete surface.
- I. Steel trowel edges of joint repair material to a feather edge to match adjacent floor elevation.

3.06 FINISHING SLABS

- A. Uniformly spread, screed and consolidate concrete. Do not spread concrete by vibration.
- B. Float Finish: Float with hand float or with a powered disc float. High spots to be cut down and low spots to be filled. Use as preparation for further finishing.

- C. Scratched Finish: Mechanically float surfaces. Roughen with stiff brushes before final set. Use for ceramic tile with full bed setting systems substrate slab beneath topping and where indicated.

3.07 SLAB TOLERANCES

- A. Maintain slab tolerance as defined in ACI 302.1R of (SOV) F_F35 and F_L25 and (MLV) F_F24 and F_L17 as measured by ASTM E1155 for slabs on grade.
- B. Correct the slab surface if the actual FF/FL number for the floor installation measures less than required.
- C. After correction of slab surface to specified tolerance, apply curing, hardening and vapor barrier over corrected surface.
- D. In areas of floor drains, maintain floor levels at the walls and slope surface uniformly to drains at 1/8 inch per foot.

3.08 CURING

- A. Apply curing, hardening and vapor barrier compound on all floor slabs that are not exposed and indicated to be sealed.
- B. Cure concrete surfaces in accordance with ACI 301.
- C. Spray apply curing, hardening and vapor barrier compound on finished slab surfaces located below grade, at grade, and above grade in two "wet on wet" flood coats at the total rate of 200 sq. ft./gallon in accordance with manufacturer's instructions.
- D. Application of compound shall be by a trained applicator acceptable to compound manufacturer.
- E. After application of curing, hardening, and vapor barrier compound, moist cure concrete using the following method:
- F. Spraying: Fog spray clean, potable water over floor slab areas and maintain moist for 10 days.
- G. Polyethylene Film: Spread over floor slab areas, lap edges and sides, maintain in place for 10 days.

3.09 SEALING

- A. Apply sealing compound on finished floor slab surfaces that are not to receive a finished floor covering and are indicated to be exposed and sealed.
- B. Apply sealing compound immediately following finishing operation.
- C. Apply sealing compound in sufficient quantities to keep entire surface wet for a minimum of 30 minutes.
- D. Lightly mist surface with water as compound is absorbed into surface.
- E. Flush surface with water and squeegee surface free of excess compound.
- F. Burnish final concrete surface with propane burnisher.

3.10 PATCHING

- A. Notify Architect immediately upon removal of forms to determine areas that will require patching.
- B. Surface defects shall include color and texture irregularities, stains, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections and discolorations in the surface that cannot be removed by cleaning.
- C. Patch imperfections in accordance with ACI 301.

3.11 DEFECTIVE CONCRETE

- A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.
- B. Repair or replace concrete not properly placed or of the specified type.

3.12 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 45 29 [and as required by the Division of the State Architect and District Inspector].
- B. Owner's Inspector will take cylinders and perform slump and air entrainment tests in accordance with ACI 301 and will arrange for pick-up by Testing Laboratory.

- C. Three cylinders will be taken for every 50 yards, or fraction thereof, for each class of concrete for each day.
- D. Tests of cement and aggregates will be performed by Testing Laboratory to ensure conformance with requirements stated herein.
- E. Slab tolerance as measured by ASTM E1155 shall be performed within 72 hours of floor slab installation.
- F. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.13 PROTECTION

- A. Protect finished work under provisions of Section 01 61 00.
- B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members and support members.
- B. Baseplates, and anchor bolts.
- C. Grouting under baseplates.

1.02 REFERENCES

- A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.
- B. ASTM A36 - Carbon Structural Steel.
- C. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- D. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- E. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- F. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- G. ASTM A490 - Structural Bolts, alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
- H. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- I. ASTM A992 - Standard Specification for Steel for Structural Shapes for Use in Building Framing.
- J. ASTM C1107 - Packaged Dry, Hydraulic Cement Grout (non shrink).
- K. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 KSI Yield Strength.

- L. AWS A2.4 - Standard Welding Symbols.
- M. AWS D1.1 - Structural Welding Code - Steel.
- N. ANSI / ASCE 360 - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- O. ANSI / ASCE 303 - Specification for Architectural Exposed Structural Steel.
- P. SSPC - The Society for Protective Coatings.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings:
 - Indicate profiles, sizes, spacing, and locations of structural members, connections, cambers and loads.
 - Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Submit under provisions of Section 01 33 00 certifying that products meet or exceed specified requirements.
- D. Mill Test Reports: Submit under provisions of Section 01 33 00 Manufacturer's Certificates, indicating structural strength and destructive and non-destructive test analysis.
- E. Welders' Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. Perform Work in accordance with AISC - Specification for Architectural Exposed Structural Steel where indicated on the drawings.

1.05 QUALIFICATIONS

- A. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of California.
- B. Design connections in accordance with CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 22A.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Structural Steel Members: ASTM A36. W and WT shapes, ASTM A992.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Steel Pipe: ASTM A53, Grade B.
- D. Shear Stud Connectors: ASTM A108, Grade 1015, forged steel, headed, unfinished.
- E. Threaded Bolts, Nuts, and Washers: ASTM A36
- F. Anchor Bolts: ASTM F1554
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.

2.02 FABRICATION

- A. Fabricate structural steel members in accordance with AISC Specification.
- B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

2.03 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP-2.
- B. Shop and Touch-Up Primer: SSPC 15, Type 1, Red Oxide.
- C. Shop prime structural steel members. Do not prime surfaces that will

be fireproofed, field welded or in contact with concrete or masonry.

- D. Finish: Site paint exposed to view structural steel members under provisions of Section 09 90 00.

2.04 SOURCE QUALITY CONTROL AND TESTS

- A. Testing and analysis of components will be performed under provisions of Section 01 43 00

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.02 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on Drawings.
- C. Field connect members with threaded fasteners indicated; torque to required resistance.
- D. Do not field cut or alter structural members without approval of Architect.
- E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.03 GROUTING

- A. Clean concrete on masonry bearing surfaces.
- B. Roughen bearing surface prior to setting base and bearing plates.

- C. Set base and bearing plates on wedges, shims, or setting nuts.
- D. Tighten anchor bolts after members are positioned and plumb.
- E. Cut off protruding wedges or shims flush with edge of base or bearing plate.
- F. Pack grout solidly between bearing surfaces and plates so no voids remain.
- G. Finish exposed surfaces, protect installed materials, and allow to cure.

3.04 ERECTION TOLERANCES

- A. Erect structural steel members in accordance with AISC Specification.

3.05 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 43 00.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated ferrous metal items, galvanized and prime painted.
- B. All other metal fabrication items not specifically described in other Section of these Specifications.

1.02 RELATED WORK

- A. Requirements in Addenda, Alternates, Conditions and Division 1, collectively apply to this work.
- B. Section 03 30 00 - Cast-in-Place Concrete (Placement of sleeves in concrete).
- C. Section 06 10 00 - Rough Carpentry.

1.03 REFERENCES AND STANDARDS

- A. References:
 - 1. Code References and Requirements: Title 24 of the California Code of Regulations (CCR), CBSC current Edition.
 - 2. "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.
 - 3. Specifications for the Design of Cold-Formed Steel Structural Members of the American Iron and Steel Institute.
 - 4. Recommended Practices for Resistance Welding of the American Welding Society.
- B. Industry Standards:
 - 1. ASTM A36/A36M-12 - Structural Steel.
 - 2. ASTM A53/A53M-12 - Hot-dipped, Zinc-coated Welded and Seamless Steel Pipe.
 - 3. ASTM A307-12 - Low-Carbon Steel Externally and Internally Threaded Fasteners.
 - 4. ASTM A325-10e1 - High Strength Bolts for Structural Steel Joints.
 - 5. ASTM A123/A123M-13 - Zinc-Coating (Hot-dip) on Assembled Steel Products.
 - 6. ASTM A500/A500M-13 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 7. ASTM A501-07 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 8. AWS D1.1 - Structural Welded Code.
 - 9. FS TT-P-31 - Paint, Oil, Iron Oxide, Ready Mix, Red and Brown.
 - 10. FS TT-P-541 - Primer Coating, Zinc Dust Zinc Oxide (for galvanized surfaces).

11. FS TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.

1.04 QUALIFICATIONS OF WELDERS

All welding shall be performed by certified welders, using shielded arc process.

1.05 SUBMITTALS

- A. Provide required submittals prior to installation in accordance with Section 01 33 00 - Submittals.
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, type of fasteners and accessories.
 - 2. Include erection drawings, elevations and details.
- B. Submit five copies of Shop Drawings, prepared under the direction of a licensed Structural Engineer, to the Architect for approval. Indicate all locations, markings, quantities, materials, sizes and shapes and all methods of connecting, anchoring, fastening, bracing and attaching to the work of other trades. Indicate welded connections using standard AWS A2-0 welding symbols. Indicate net weld length.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
 - 1. Steel Plates, Shapes and Bars: ASTM A36/A36M-12.
 - 2. Steel Bar Grating: ASTM A569/A569M-98 or ASTM A36/A36M-12.
 - 3. Steel Tubing: Cold Formed, ASTM A500/A500M-13, Grade B.
 - 4. Structural Steel Sheet: Hot-rolled, ASTM A570/A570M-98; or cold-rolled ASTM A611, Class 1; of grade required for design loading.
 - 5. Galvanized Structural Steel Sheet: ASTM A446-76(1981)e1 of grade required for design loading. Coating designation as indicated or if not indicated, G90-10.
 - 6. Steel Pipe: ASTM A53/A53M-12: Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.
 - 7. Gray Iron Casting: ASTM A48/A48M-03 (2012), Class 61.
 - 8. Malleable Iron Casting: ASTM A47/A47M-99(2009), grade as selected by fabricator.
 - 9. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

10. Concrete Inserts: Threaded or wedge type; galvanized ferrous casting either malleable iron, ASTM A47/A47M-99(2009), or cast steel, ASTM A27/A27M-13. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A53/A153M-12.
11. Surface Preparation:
 - a. Prepare ferrous metal surfaces to comply with minimum requirements indicated below for Steel Structures Painting Council (SSPC) surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1) Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast cleaning.
 - 2) Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".
- B. Pipe: ASTM A53/A53M-12 Grade B Schedule 40, galvanized for exterior applications.
- C. Bolts, Nuts, and Washers: ASTM A325-10e1, galvanized to ASTM A153/A153M-09 for galvanized components.
- D. Welding Materials: AWS D1.1; type required for materials being welded.
- E. Fittings, Elbows, T-shapes, wall brackets, escutcheons, cast steel.
- F. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.
- G. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- H. Touch-Up Primer for Galvanized Surfaces: Zinc rich type.
- I. Stainless Steel: ASTM A167-99 (2009), Type 304, commercial grade.
- J. Concrete Stair Nosing: Alumogrit, Type 116-A; 3" deep, safety nosing as manufactured by Wooster Products Inc.; Wooster, OH; 800-321-4936, or approved equivalent; with the following features:
 1. Abrasive shall be #20 virgin grain Aluminum Oxide abrasive, integrally cast into the walking surface to a minimum depth of 1/32".
 2. Provide 2" contrasting color (minimum 70% contrast) warning strips, maximum 1" from edge of nosing of each exterior stair and top and bottom nosing only at interior stairs.
 3. Beveled back end.
 4. Nosings shall terminate not more than 4" from ends of steps, with beveled ends.

2.02 FASTENERS

- A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

- B. Bolts and Nuts: Regular hexagon head type, ASTM A307-12, Grade A.
- C. Machine Screws: Cadmium plated steel, FS FF-S-92.
- D. Plain Washers: Round, carbon steel, FS FF-W-92.
- E. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
- F. Lock Washers: Helical spring-type carbon steel, FS FF-W-84.

2.03 FINISHES

- A. Clean surfaces of rust, scale, grease and foreign matter prior to finishing.
- B. Paint:
 - 1. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capacity to provide a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS-P-645. Shop prime all steel except galvanized steel and steel to be encased in concrete or masonry. Before prime painting, thoroughly clean all steel including that to be encased in concrete. Preparation shall conform to SSPC-SP6.
 - 2. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.
 - 3. Galvanized items shall receive minimum 2.0 oz./sq.ft. coating in accordance with ASTM A123/A123M-13.
- C. Stainless Steel: ASTM A167-99 (2009) Type 304, No. 4 Satin finish, commercial grade.

2.04 FABRICATION, GENERAL

- A. Fabricator:
 - 1. Woverine Fence Company, 930 S. Cypress Street, LaHabra, CA 562-294-2030 or approved equal.
- B. Workmanship:
 - 1. Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on Shop Drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
 - 2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - 3. Weld corners and seams continuously, complying with AWS

recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated, or if not indicated, Phillips flat-head (counter-sunk) screws or bolts.
5. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
6. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

C. Galvanizing:

1. Provide a zinc coating for those items shown or specified to be galvanized, as follows:
 - a. ASTM A153/A153M-09: For galvanizing iron and steel hardware.
 - b. ASTM A123/A123M-13: For galvanizing rolled, pressed and forged steel shapes, plates, bars, and strip 1/8" thick and heavier.
2. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

D. Steel Pipe Railings: ASTM A53/A53M-12, Type E (electric-resistance welded) or Type S (seamless), Grade B, Schedule 40. Fabricate to dimensions indicated on Drawings. Cope vertical railings intersecting horizontal members. Provide radius bends at changes in direction. Finish: Prime painted at interior applications and galvanized at exterior applications, ready to paint.

1. Set-in sleeves and secure railings to other construction, as indicated on Drawings.
2. Handrails and Top Rails: Design point load 200 lbs., downward or horizontal and uniform load of 50 lb. /lin/ ft. applied simultaneously in both vertical and horizontal directions. Concentrated and uniform loads need not be assumed to act concurrently.
3. Intermediate Rails: Uniform load of 25 lbs./sq.ft. of gross area of railing system, including open area.
4. Handrail Brackets: Cast iron with 1-1/2" clear, from face of wall. Finish as indicated below.
 - a. Interior: Prime paint finish, as indicated in Section 09900 - Painting.
 - b. Exterior: Galvanized steel ready to paint.
5. Handrails for stairs and ramps shall be 1-1/4" to 1-1/2" (1-1/2" nominal) diameter.
6. All welded joints and surfaces shall be ground smooth, no sharp or abrasive corner edges or surfaces. Wall surface adjacent to handrail shall be smooth.

E. Concrete Stair Nosing:

Integral cast-in-place concrete stair nosing, American Safety Tread or approved equivalent. Paint each tread nosing with 2" wide strip of yellow as indicated (70% contrasting color).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, do not delay job progress, allow for trimming and fitting where taking field measurements before fabrication might delay work.
- C. Coordinate and furnish anchorage, setting drawings, diagrams, templates, instructions, and directions for installation of anchorage such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.03 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete inserts, through-bolts and other connections as required.
- B. Cutting, Fitting and Placement:
 - 1. Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.
 - 2. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shopping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and we are intended for bolted or screwed field connections.
- C. Field Welding:
Comply with AWS D1.1 Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made and methods used in correcting welding work.

- D. Install items plumb and level, accurately fitted, free from distortion or defects.
 - 1. Coordinate installation schedule with the schedule of other trades to ensure orderly and timely progress of the Work.
 - 2. Erect and install all metal fabrications in strict accordance with the Drawings, the approved Shop Drawings and the referenced standards, aligning straight, plumb and level with a tolerance of 1 in 200.
- E. Handrails and Railings: Furnish anchors required for connecting railings to Structure. Anchor railing to structure.
- F. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- G. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- H. After the erection and installation is complete, touch up all shop priming coats damaged during transportation and erection and grind and prime coat all field weld, using priming paint specified for the shop priming.
- I. Touch up all galvanized areas damaged by welding or during erection with specified galvanizing repair paint. At galvanized handrails touch up welds with 50/50 bar (50% zinc/50%lead).
- J. Weld joints in stainless steel, work tight, without open seams.

END OF SECTION

POLYVINYL CHLORIDE (PVC) MEMBRANE ROOFING GENERAL

1.1 SECTION INCLUDES

- A. Adhered PVC membrane ROOFING system.
- B. Mechanically fastened PVC membrane ROOFING system.
- C. Induction welded PVC membrane roofing system.
- D. Cover board.
- E. Roof insulation.
- F. Vapor retarder.
- G. Base sheet.
- H. Substrate board.

1.2 NOT USED

1.3 REFERENCES

- A. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms in this Section:
 - 1. ASTM D 1079 "Standard Terminology Relating to Roofing and Waterproofing."
 - 2. Glossary of NRCA's "The NRCA Roofing and Waterproofing Manual."

3. Roof Consultants Institute "Glossary of Building Envelope Terms."

- B. Sheet Metal Terminology and Techniques: SMACNA "Architectural Sheet Metal Manual."

1.4 DESIGN CRITERIA

- A. General: Installed roofing membrane system shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.
- C. Installer shall comply with current code requirements based on authority having jurisdiction.
- D. Wind Uplift Performance: Roofing system shall meet the intent of systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE 7.
- E. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
1. Exterior Fire-Test Exposure: Class A; UL 790, for application and roof slopes indicated.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data sheets for each product to be provided.
- B. Detail Drawings: Provide roofing system details and details of attachment to other work, including:
1. Base flashings and membrane terminations.
 2. Tapered insulation, including slopes.
 3. Crickets, saddles, and tapered edge strips, including slopes.
 4. Insulation fastening and adhesive patterns.
- C. Verification Samples: Provide for each product specified.
- D. Installer Certificates: Confirmation that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

- E. Maintenance Data: Refer to Johns Manville's latest published documents on www.JM.com.
- F. Guarantees: Provide manufacturer's current guarantee specimen.
- G. Prior to roofing system installation, roofing sub-contractor shall provide a copy of the Guarantee Application Confirmation document issued by Johns Manville Roofing Systems indicating that the project has been reviewed for eligibility to receive the specified guarantee and registered.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product who is eligible to receive the specified manufacturer's guarantee.
- A. Manufacturer Qualifications: Qualified domestic U.S. owned and based manufacturer that has UL listing or accredited testing agency listing for roofing system identical to that used for this Project.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 329.
- C. Test Reports:
 - 1. Roof drain and leader test or submit plumber's verification.
 - 2. Core cut, if required.
 - 3. Roof deck fastener pullout test, if required.
- D. Moisture Survey, if required:
 - 1. Submit prior to installation, results of a non-destructive moisture test of roof system completed by approved third party. Utilize one of the approved methods:
 - a. Infrared Thermography
 - b. Nuclear Backscatter
- E. Source Limitations: Obtain all components from the single source roofing manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the guarantee.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and guarantee requirements.

1.9 GUARANTEE

- A. Provide manufacturer's system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.
 - 1. Single-source special guarantee includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, adhesives, cover board, substrate board, vapor retarder, base sheet, walkway products, manufacturer's expansion joints, manufacturer's edge metal products, and other approved single-source components of roofing system marketed by the manufacturer.
 - 2. Guarantee Period: 15 years from date of Substantial Completion.
 - 3. Contractor is required to list the Specifier/Consultant of record in the appropriate fields when applying for the manufacturer's warranty.
- B. Installer's Guarantee: Submit roofing Installer's guarantee, including all components of roofing system for the following guarantee period:
 - 1. Guarantee Period: Two years from date of Substantial Completion.
- C. Existing Guarantees: Guarantees on existing building elements should not be affected by scope of work.

1. Installer is responsible for coordinating with building owner's representative to verify compliance.

PART 2 - PRODUCTS

2.1 POLYVINYL-CHLORIDE ROOFING MEMBRANE - PVC

- A. PVC Sheet: ASTM D 4434, Type III, fabric reinforced. For patching at HVAC.
 1. Thickness: 50 mils (1.27 mm), nominal.
 2. Exposed Face Color: White

2.2 AUXILIARY ROOFING MATERIALS – SINGLE PLY

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's internally reinforced or scrim reinforced, smooth backed membrane with same color as sheet membrane. Basis of design: JM PVC 60 mil
- C. Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for membrane.
- D. Flashing Adhesive: Manufacturer's standard water-based bonding adhesive for base flashings.
- E. Urethane Adhesive: Manufacturer's standard two component no VOC adhesive for fleece backed membranes. Basis of design: JM Roofing System Urethane Adhesive (RSUA)
- F. Urethane Adhesive: Manufacturer's self-contained two-part, low-rise foam adhesive formulated to adhere fleece-backed membranes to substrate. Basis of design: JM Two-Part Urethane Insulation Adhesive Canister
- G. Roofing Asphalt: ASTM D 312, Type IV
- H. Asphalt Primer: ASTM D 41. Basis of design: JM Asphalt Primer
- I. Liquid Applied Flashing: Manufacturer's single ply liquid and fabric reinforced flashing system created with a fleece polyester scrim and a two-component polyurethane based liquid applied flashing material, consisting of a liquid resin

and a curing agent. Basis of design: JM SP Liquid Flashing Resin and JM SP Liquid Flashing Scrim

- J. Liquid Applied Flashing Primer: Manufacturer's single ply liquid flashing primer. Basis of design: JM SP Liquid Flashing TPO and PVC Primer, JM SP Liquid Flashing Concrete Primer, or JM SP Liquid Flashing Metal and Wood Primer
- K. Slip Sheet: Minimum 9.0 oz/yd² needle punched, UV-resistant polyester fabric slip sheet, as required for application. Basis of design: JM Polyester Mat Protection Slipsheet
- L. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors. Basis of design: JM Termination Systems
- M. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- N. Induction Welding Plate: A round specially coated Galvalume® plate with a recessed center and raised flat bonding surface specifically designed for induction welding application. Basis of design: JM PVC RhinoPlate
- O. Polymer Fasteners: Glass-reinforced nylon fasteners with ¼" square drive and 1" head with Galvalume®*-coated 2" metal stress plates, designed to lock into the fastener head. Fasteners designed for fastening roof insulation to substrate and furnished by roofing system manufacturer. Basis of design: Polymer Auger Fasteners and Plates
- P. Miscellaneous Accessories: Provide all accessories to meet the roofing manufacturer's guarantee requirements.

2.3 WALKWAYS AND SAFETY STRIPS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads sourced from membrane roofing system manufacturer.
- B. Safety Strips: Manufacturer's minimum 45 mils, reinforced, UV-resistant PVC (polyvinyl chloride) with Elvaloy KEE (ketone ethylene ester) safety warning line for roof perimeters. Basis of design: JM PVC Safety Strip

- 1. Exposed Face Color: Yellow

2.4 COVER BOARD

- A. Polyisocyanurate Board: ASTM C 1289, Type II, Class 1, Grade 2 (20 psi) polyisocyanurate bonded in-line to fiber glass reinforced facer.

- B. Perlite Board: ASTM C 728, Type 3; composed of expanded perlite, cellulosic fibers, binders and waterproofing agents with top surface seal-coated. Basis of design: RetroPlus Roof Board.
- C. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 3, High-density Polyisocyanurate technology bonded in-line to mineral-surfaced, fiber glass reinforced facers with greater than 140 lbs of compressive strength. Basis of design: Invinsa Roof Board
- D. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate technology bonded in-line to inorganic coated glass facers with greater than 80 lbs of compressive strength. Basis of design: Protector HD
 - 1. Thickness: 1/2 inch (13 mm)
 - 2. R-value: 2.5
- E. Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications, [1/4 inch (6 mm)] [1/2 inch (13 mm)] [5/8 inch (16 mm)] thick.
- F. Gypsum Fiber Board: ASTM C 1278, non-faced, gypsum and cellulose fiber substrate, 1/2 inch (13 mm) thick. Basis of design: Securock Gypsum-Fiber Roof Board

2.5 ROOF INSULATION – FLUTE FILLER

- A. General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, Product: ENRGY 3
 - 1. Provide metal roof flute filler insulation package with thickness to fill flutes the height of the standing seam.

2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
 - 1. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Basis of design: [ENRGY 3] Provide insulation package with minimum R Value: Match existing adjacent roof insulation.

2. Provide insulation package in multiple layers.
3. Minimum Long-Term Thermal Resistance (LTTR): 5.7 per inch.
 - a. Determined in accordance with CAN/ULC S770 at 75°F (24°C)

2.7 TAPERED INSULATION

- A. Tapered Insulation: ASTM C 1289, Type II, Class [1] Grade [2 (20 psi) provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated.

2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Provide saddles, crickets, tapered edge strips, and other insulation shapes, where indicated for sloping to drain. Fabricate to slopes indicated. Basis of design: Tapered Fesco Edge Strip
- C. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and furnished by roofing system manufacturer.
- D. Polymer Fasteners: Glass-reinforced nylon fasteners with 1/4" square drive and 1" head with Galvalume®-coated 3" metal stress plates, designed to lock into the fastener head. Fasteners designed for fastening roof insulation to substrate and furnished by roofing system manufacturer. Basis of design: Polymer Auger Fasteners and Plates
- E. Urethane Adhesive: Manufacturer's two component polyurethane adhesive formulated to adhere insulation to substrate.
- F. Wood Nailer Strips: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry."

2.9 VAPOR RETARDER

- A. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt. Basis of design: GlasPly IV.
- B. Torch Applied SBS Vapor Retarder: [ASTM D 6163, Grade S, Type I, glass-fiber-reinforced] [ASTM D 6164, Grade S, Type I, polyester-reinforced], SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.

- C. Self-Adhered SBS Vapor Retarder: [ASTM D 6163, Grade S, Type I, glass-fiber-reinforced], SBS-modified asphalt sheet; sand surfaced; suitable for application method specified. Basis of design: DynaGrip Base SD/SA.
- D. Asphalt Primer: ASTM D 41. Basis of design: JM Asphalt Primer
- E. Self-Adhered SBS Vapor Retarder: Tri-laminate woven polyethylene, nonslip UV protected top surface; suitable for application method specified.
- F. Self-Adhered Primer: One-part penetrating primer solution to enhance the adhesion of self-adhering membranes.
- G. Polyethylene Vapor Retarder: ASTM D 4397, [6 mils (0.15 mm)] [10 mils (0.25 mm)] thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

2.10 BASE-SHEET MATERIALS

- A. Base Sheet: ASTM D 4601, Type II non-perforated, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
- B. Base Sheet: ASTM D 4897, Type II, venting, non-perforated, heavyweight, asphalt-impregnated and -coated, glass-fiber base sheet with coarse granular surfacing or embossed venting channels on bottom surface. Basis of design: Ventsulation Felt
- C. Base-Sheet Fasteners: Twin legged factory-coated steel fasteners and Galvalume metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening base-sheet to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Product: Lightweight Concrete (LWC) Base Sheet Fasteners
- D. Base-Sheet Fasteners: Tube, disk and locking staple design, factory-coated steel fasteners and Galvalume metal battens meeting corrosion-resistance provisions in FMG 4470, designed for fastening base-sheet to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Product: UltraLok Locking Impact Fastener
- E. Base Sheet Fasteners: 32 gauge, 1-5/8" diameter tin caps with 11-gauge annular ring shank nails.

2.11 SUBSTRATE BOARD

- A. Gypsum Board: ASTM C 1177, coated glass-mat facer, water-resistant gypsum substrate for mechanically attached roof applications, matching existing adjacent material.

- B. Gypsum Board: ASTM C 1177, Heavy duty coated glass-mat facer, water-resistant gypsum substrate for adhered roof applications, matching existing adjacent material.
- C. Gypsum Fiber Board: ASTM C 1278, non-faced, gypsum and cellulose fiber substrate, matching existing adjacent material.
- D. High-Density Polyisocyanurate: ASTM C 1289, Type II, Class 4, Grade 1, High-density Polyisocyanurate technology bonded in-line to inorganic coated glass facers with greater than 80 lbs of compressive strength. Basis of design: Protector HD
 - 1. Thickness: 1/2 inch (13 mm)
 - 2. R-value: 2.5

2.12 EDGE METAL COMPONENTS

- A. Expansion Joints: Provide factory fabricated weatherproof, exterior covers for expansion joint openings consisting of flexible rubber membrane, supported by a closed cell foam to form flexible bellows, with two metal flanges, adhesively and mechanically combined to the bellows by a bifurcation process. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.
- B. Coping System: Manufacturer's factory fabricated coping consisting of a base piece and a snap-on cap. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.
- C. Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a snap-on cover. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.
- D. Metal Edge System: Manufacturer's factory fabricated metal edge system used to terminate the roof at the perimeter of the structure. Provide product from single-source roofing system supplier that is included in the No Dollar Limit guarantee.
- E. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

2.13 REFLECTIVE COATING

- A. Elastomeric Coating: ASTM D 6083. A multipurpose, acrylic elastomeric coating for use over a variety of substrates. Basis of design: TopGard 4000
- B. Base Coat: One-part acrylic elastomeric, with bleed-blocking properties for coating over asphalt surfaces. Basis of design: TopGard Base Coat

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with the requirements affecting performance of roofing system.
 - 1. General:
 - a. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 - b. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 2. Steel Decks:
 - a. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
 - b. Verify that decking is visibly dry and free of moisture.
 - c. Verify that the decking is smooth and free of large cracks, holes or sharp changes in elevation of the surface.
 - d. When applicable perform pull test with the specific fastener being used on the project to confirm the fastener resistance meets the requirements for that particular system.
 - 3. Ensure general rigidity and proper slope for drainage.
 - 4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
- B. Unacceptable panels should be brought to the attention of the General Contractor and Project Owner's Representative and shall be corrected prior to installation of roofing system.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.

- C. If applicable, prime surface of deck with primer at a rate recommended by roofing manufacturer and allow primer to dry.
- D. Proceed with each step of installation only after unsatisfactory conditions have been corrected.

3.3 RE-ROOF PREPARATION

- A. Remove all roofing membrane, surfacing, coverboards, insulation, fasteners, asphalt, pitch, adhesives, etc.
 - 1. Remove an area no larger than can be re-roofed in one day.
- B. Tear out all base flashings, counterflashings, pitch pans, pipe flashings, vents, sumps and like components necessary for application of new membrane.
- C. Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations.
 - 1. Install decking to match existing as directed by Owner's Representative.
- D. Raise (disconnect by licensed craftsmen, if necessary) all HVAC units and other equipment supported by curbs to conform with the following:
 - 1. Modify curbs as required to provide a minimum 8" base flashing height measured from the surface of the new membrane to the top of the flashing membrane.
 - 2. Secure of flashing and install new metal counterflashing prior to re-installation of unit.
 - 3. Perimeter nailers shall be elevated to match elevation of new roof insulation.
- E. Immediately remove all debris from roof surface. Demolished roof system may not be stored on the roof surface.

3.4 RE-COVER PREPARATION

- A. Prepare existing roof according to roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer, and requirements in this Section.
- B. Tear out all base flashings, counterflashings, pitch pans, pipe flashings, vents, sumps and like components necessary for application of new membrane.
- C. Disable existing roof membrane per manufacturer's written instruction.
- D. Remove existing membrane per manufacturer's written instructions.

- E. Remove and replace wet, deteriorated or damaged roof insulation and decking as identified in moisture survey.
- F. Remove abandoned equipment curbs, skylights, smoke hatches, and penetrations. Install decking to match existing as directed by Owner's Representative.
- G. Raise, (disconnect by licensed craftsmen, if necessary) all HVAC units and other equipment supported by curbs to conform with the following:
 - 1. Modify curbs as required to provide a minimum 8-inch base flashing height measured from the surface of the new membrane to the top of the flashing membrane.
 - 2. Secure top of flashing and install new metal counterflashing prior to re-installation of unit.
 - 3. Perimeter nailers shall be elevated to match elevation of new roof insulation.
- H. Immediately remove all debris from roof surface. Demolished roof system may not be stored on the roof surface.
- I. Install polyester slip sheet as a loosely laid single layer beneath single ply membrane, side and end lapping each sheet a minimum of 3 inches (76.2 mm) and 6 inches (150 mm), respectively. Sheet may be tacked into place as deemed necessary.

3.5 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturer's written instructions.

3.6 BASE-SHEET INSTALLATION

- A. Install one lapped base sheet course and mechanically fasten to substrate according to roofing system manufacturer's written instructions.
 - 1. Enhance fastening rate in perimeter and corner zones according to code requirements, wind uplift system approvals or manufacturer's guarantee requirements, whichever is more stringent.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.

3.7 VAPOR-RETARDER INSTALLATION

- A. Install polyethylene-sheet vapor retarder as a loosely laid single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively.
 - 1. Seal side and end laps.
- B. Install 2 glass-fiber felt plies lapping each sheet 19 inches (483 mm) over preceding sheet. Embed each sheet in a solid mopping of hot roofing asphalt per manufacturer's written instructions.
- C. Install modified bituminous vapor retarder sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
 - 1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
 - 2. Heat weld vapor retarder to substrate according to roofing system manufacturer's written instructions.
 - 3. Adhere vapor retarder in a full mopping of hot asphalt to substrate according to roofing system manufacturer's written instructions.
 - 4. Self-adhere vapor retarder to substrate according to roofing system manufacturer's instructions.
- D. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 - 1. Repair tears and voids in laps and lapped seams not completely sealed.
- E. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.8 FLUTE FILLER INSULATION INSTALLATION

- A. Coordinate installation of roof system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- C. Loose lay Polyisocyanurate flute filler insulation between the metal roof standing seams.

3.9 INSULATION INSTALLATION

- A. Coordinate installation of roof system components so insulation and cover board are not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installation of roof insulation and cover board.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation boards with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer's written instructions. Fill gaps exceeding 1/4 inch (6 mm) with like material.
- E. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- F. Trim surface of insulation boards where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- H. Preliminarily Fastened Insulation [for Mechanically Fastened Membrane Systems]: Install insulation with fasteners at rate required by roofing system manufacturer or applicable authority, whichever is more stringent.
 - 1. Fasten top layer to resist uplift pressure at corners, perimeter, and field of roof.
- I. Adhered Insulation: Adhere each layer of insulation to substrate as follows:
 - 1. Install each layer in a two-part urethane adhesive according to roofing system manufacturer's instruction.
 - 2. Install each layer to resist uplift pressure at corners, perimeter, and field of roof.
- J. Loose Laid Insulation with Top Insulation Layer Mechanically Fastened: Loose lay insulation with staggered joints and secure top layer of insulation to deck using mechanical fasteners designed and sized for fastening specified board-type to deck type.
 - 1. Fasten top layer to resist uplift pressure at corners, perimeter, and field of roof.
- K. Loose Laid Insulation: Loose lay all layers of insulation with staggered joints.

- L. Mechanically Fastened with Subsequent Layers Adhered Insulation: Secure first layer of insulation to deck using mechanical fasteners designed and sized for fastening specified board-type to deck type.
 - 1. Fasten first layer to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Install subsequent layers in a two-part urethane adhesive according to roofing system manufacturer's instruction.
 - 3. Install subsequent layers in a hot roofing asphalt according to roofing system manufacturer's instructions.
 - 4.** Install each layer to resist uplift pressure at corners, perimeter, and field of roof.

3.10 COVER BOARD INSTALLATION

- A. Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.
- C. Install cover board with long joints in a continuous straight line. Joints should be staggered between rows, abutting edges and ends per manufacturer's written instructions. Fill gaps exceeding 1/4 inch (6 mm) with cover board.
 - 1. Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- D. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
 - 1. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- E. Preliminarily Fastened Insulation [for Mechanically Fastened Membrane Systems]: Install insulation with fasteners at rate required by roofing system manufacturer or applicable authority, whichever is more stringent.
 - 1. Fasten top layer to resist uplift pressure at corners, perimeter, and field of roof.
- F. Adhered Cover Board: Adhere cover board to substrate as follows:
 - 1. Install in a two-part urethane adhesive according to roofing system manufacturer's instruction.
 - 2. Install to resist uplift pressure at corners, perimeter, and field of roof.

- G. Mechanically Fastened Cover Board: Install cover board and secure to deck using mechanical fasteners designed and sized for fastening specified cover board to deck type.

- 1. Fasten to resist uplift pressure at corners, perimeter, and field of roof.

3.11 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.
- B. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- C. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.12 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing in accordance with membrane roofing system manufacturer's written instructions.
 - 1. Unroll roofing membrane and allow to relax before installing.
- B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Solvent Based Bonding Adhesive for smooth backed membranes: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- D. Water Based Bonding Adhesive for smooth backed membranes: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

- E. Bonding Adhesive for fleece backed membranes: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- F. Urethane Membrane Adhesive for fleece backed membranes: Apply Urethane Adhesive to substrate at rate required by manufacturer and install fleece-backed roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- G. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roofing membrane with side laps shingled with roof slope, where possible.
- I. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - a. Remove and repair any unsatisfactory sections before proceeding with installation.
 - 3. Repair tears, voids, and incorrectly lapped seams in roofing membrane that do not meet requirements.
- J. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- K. Install roofing membrane and auxiliary materials to tie into existing roofing.

3.13 MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing in accordance with roofing system manufacturer's written instructions.
 - 1. Unroll roofing membrane and allow it to relax before installing.
 - 2. Install sheet in accordance with roofing system manufacturer's written instructions.
- B. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

- C. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- D. Always install membrane laps perpendicular to the steel deck flutes. "Picture Frame" installation method is not permitted.
- E. Apply roofing membrane with side laps shingled with roof slope, where possible.
- F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - a. Remove and repair any unsatisfactory sections before proceeding with work.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
- G. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- H. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.

3.14 INDUCTION WELDED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Always install membrane laps perpendicular to the steel deck flutes. "Picture Frame" installation method is not permitted.
- D. Apply roofing membrane with side laps shingled with roof slope, where possible.
- E. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane per manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - a. Remove and repair any unsatisfactory sections before proceeding with work.
 3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
- F. Spread sealant or mastic bead over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- G. Induction Welding Installation:
1. Perform calibration and set-up as detailed by the Induction Welder Owner's Manual
 2. Center the Induction Welder over the first plate in pattern and activate the weld.
 - a. Induction Welder shall be centered over the plate to create a 100% bond.
 - b. If an error occurs during activation, refer to the induction welder owner's manual for corrective action.
 3. Prior to every use, clean face of Heat Sink Magnet.
 4. Place Heat Sink Magnet over the welded plate.
 - a. Keep Heat Sink Magnet in place at least 45 seconds while the assembly cools.
 5. Repeat process for each plate.

3.15 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply solvent-based bonding adhesive at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Apply water-based bonding adhesive in two-sided application, at required rate, and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

- D. Apply single ply liquid applied flashing system per manufacturer's written instructions.
- E. Flash penetrations and field-formed inside and outside corners per manufacturer's installation instructions.
- F. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- G. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.16 EDGE METAL INSTALLATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Provide edge details as indicated on the Drawings. Install in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."
- C. Join individual sections in accordance with the membrane manufacturer's requirements and SMACNA's "Architectural Sheet Metal Manual."

3.17 COATING INSTALLATION

- A. Ensure that all surfaces are clean, dry and free of any dirt, grease, oil or other debris that may interfere with proper adhesion.
- B. Apply coating to roofing membrane and base flashings as recommended by the manufacturer. Apply in two coats allowing the first coat to completely dry before applying the second coat.

3.18 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld and adhere walkway products to substrate according to roofing system manufacturer's written instructions.
- B. Roof-Paver Walkways: Install walkway roof pavers with applicable slip sheet according to manufacturer's written instructions in locations indicated, to form walkways.

3.19 FIELD QUALITY CONTROL

- A. Owner or designated representative will provide on-site observation and inspection during installation.
- B. Owner will engage a qualified testing agency to perform tests and inspections.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion and submit report to Architect.
- D. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.20 PROTECTION AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075419

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:

1. Ceramic tile floors. Tile flooring shall be firm, stable and slip resistant, CBC section 11B-302.1.
2. Ceramic tile base.
3. Ceramic tile wainscots.
4. Ceramic tile walls.
5. Marble threshold.

B. Related Work:

1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
2. Rough Carpentry: Section 06 10 00.
3. Gypsum Wallboard: Section 09 29 00.

1.02 SUBSTITUTIONS

Only written approval of the Architect will permit substitutions for materials specified; in accordance with Article 4-338, Title 24, Part 2, CCR.

1.03 QUALITY ASSURANCE

A. Standards: In general, Work shall conform to latest edition of the following standards as applicable, and as modified herein.

1. Installation: Tile Council of America, Handbook for Ceramic Tile Installation, latest edition.
2. Materials: Applicable ANSI standards, and Tile Council of America standards.

1.04 SUBMITTALS

A. Samples (minimum of 5): Manufacturer's standard color range.

B. Spare Tile: In addition to tile required for installation, Contractor shall furnish two (2) boxes of each color of floor tile and wall tile to the District Inspector for delivery to the District.

1.05 DELIVERY, STORAGE AND HANDLING

Deliver tile to Site in sealed containers with grade seals intact. Store materials in a dry location.

1.06 PROJECT CONDITIONS

Coordinate this work with work and backing furnished under other Specifications Sections.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Tile: Conform to ANSI A137.1 Standard Specifications for Ceramic Tile and Cove Base. Tile to be standard grade; manufactured by Dal-Tile Corporation; Dallas, TX; 800-933-8453, or approved equivalent.
 - 1. Ceramic Floor and Base (where specified)Tile: Unglazed porcelain paver abrasive; natural finish; cushioned edge.
 - a. Size:
 - 1) Floor Tile: 12" x 12 " x 1/4" and 12" x 24" x 1/4".
 - b. Color: Match existing
 - c. Coefficient of Friction: ASTM C1028-07e1. TILE SHALL BE SLIP RESISTANT
 - 1) Dry > 0.80
 - 2) Wet > 0.60
 - 2. Ceramic Wall, Base (where specified) and Wainscot Tile (Field): Glazed interior tile; matte or gloss finish; cushioned edge.
 - a. Size: 12" x 24" x 1/4" .
 - b. Color: Match existing.
 - c. Provide trim shapes as required, surface bull-nose typical at outside corners and top of wainscot, integral radius coves and square inside corners.
 - 3. Ceramic Wall and Wainscot Tile (Accent): Glazed interior tile; gloss finish; cushioned edge; Color Wheel Collection, Classic.
 - a. Size: 1/2" x 1/2" x 1/4"
 - b. Color: Match existing
 - c. Provide with ceramic tile trim sections including bullnose caps and corner sections.

- B. Portland Cement: ASTM C150/C150M-12, Type 1. White Portland Cement for grouting and pointing mortar, as follows:
 - 1. Dry-Set Portland Cement Mortar: Conform to ANSI A118.1.
 - 2. Latex-Portland Cement Mortar: Conform to ANSI A118.4.
- C. Sand: Washed; graded natural sand; durable; free from deleterious substance; conforming to ASTM C144-11.
- D. Water: Domestic source; clean and potable.
- E. Waterproofing Membrane: Noble Sheet Membranes or equivalent at all second floor toilets.
 - 1. Chloraloy: CPE (chlorinated polyethylene) resin sheet membrane for use under full mortar bed installations; nominal thickness 0.04". Membrane shall meet requirements of ASTM D4068-09.
 - 2. NobleSeal CIS: Composite sheet membrane manufactured from CPE (chlorinated polyethylene) resin with non-woven fabric laminated to both sides for use with thin-bed mortar bed; nominal thickness 0.03"; rated "Extra Heavy" in ASTM C627-10 (Robinson type floor tester).
 - 3. Join all sheets with seaming cement expressly made for these products by the manufacturer.
 - 4. Other acceptable manufacturers: Latricrete 9235.
- F. Hydrated Lime: High Calcium type; ASTM C206-03 (2009) or C207-06(2011), Type S.
- G. Color For Floor Tile Grout: Pure synthetic iron oxide; lime proof; non-fading mineral pigments; colors as selected by Architect from full color range including white and black.
- H. Grout: Latex - Portland Cement Grout; conforming with ANSI 118.6.
- I. Sealant: As specified in Section 07 92 00. Provide type of sealants as classified under ASTM C666/C666M-03(2008) and as recommended by the Tile Council of America.
- J. Portland Cement Backing Board: High density, cementitious, glass fiber reinforced, 1/2" thick; WonderBoard as manufactured by Glascrete Inc.; Seal Beach, CA; 800-282-8786, or approved equivalent.

- K. Mesh: Alkali-resistant 2" glass fiber mesh tape at cementitious backerboard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces scheduled to receive tile work. Report unsatisfactory conditions.
- B. Do not start work until unsatisfactory conditions are corrected. Starting work constitutes acceptance of surfaces.

3.02 INSTALLATION - GENERAL

- A. Tile Work: By skilled mechanics and in accordance with the applicable provisions of the Handbook for Ceramic Tile Installation, by Tile Council of America.
- B. Tile sizes that are based on metric dimensions shall have joint thicknesses adjusted to maintain "inch-module" dimensions as indicated on the drawings such 2" x 2", 8" x 8", 12" x 12" or others.
- C. Install Portland Cement backerboard in accordance with manufacturer's printed instructions. Use corrosion resistant, self-drilling, 8 gauge, wafer-head screws with countersinking ribs to prevent strip-out.

3.03 INSTALLATION OF TILE - PORTLAND CEMENT MORTAR BED

- A. Scope: Unless otherwise shown or specified, exterior and interior tile work to be installed with full Portland cement mortar bed.
- B. Ceramic Tile Floors:
 - 1. Mortar Bed: Full Portland cement.
 - 2. Bond Coat (One of the following):
 - a. Conventional Portland cement mortar per ANSI A108.1.
 - b. Dry-Set or Latex Portland cement mortars per ANSI A108.5.
 - 3. Grout: Mix 1 part sand, one part cement, or approved factory-prepared mix.
 - 4. Pattern: Refer to Drawings.
 - 5. Floor Drain: Conform to sloping concrete, finish floor at floor drain.

3.04 INSTALLATION OF TILE - THINSET

- A. Install mortar, tile and grout in accordance with manufacturer's instructions.
- B. Lay tile to pattern indicated on Drawings. Do not interrupt tile pattern through openings.

- C. Cut and fit tile, tight to penetrations through tile. Form corners and bases neatly.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- E. Sound tile after setting. Replace hollow sounding units.
- F. Allow tile to set for a minimum of 48 hours prior to grouting.
- G. Grout tile joints using commercial Portland cement grout.
- H. Apply sealant to junction of tile and dissimilar materials.
- I. Apply sealant to junction of tile and dissimilar materials in accordance with Section 07 92 00. Install in accordance with vertical and horizontal joint movements as recommended by the Tile Council of America, latest edition.
- J. Refer to drawings for tile at floor drains. Cut as required to provide neat, smooth slope to floor drain. Maximum joint width shall be 1/16".

3.05 CLEANING

- A. Protection: Protect finish hardware and adjacent materials' surfaces with Vaseline in cases where acid solutions are used.
- B. Cleaning: Upon completion of any portion of tile work, remove rubbish and unused materials incidental to the installation, and give the finished surfaces a thorough cleaning in an approved manner. Remove traces of cement and dust accumulations.
 - 1. Do not use acid solutions on glazed tile work.
 - 2. Mix acid solution where required to clean unglazed tile, in proportions of 10% muriatic (HCL) acid to 90% water. Rinse with clear water to eliminate the acid salts precipitating from interaction with the cement particles. Do not allow the acid solution to dry on the face of the tile.

END OF SECTION

PART 1 - GENERAL 2/13/18

1.01 SUMMARY

A. Work Included:

1. Surface preparation.
2. Complete application of paint to interior and exterior surfaces.
3. Application of finish coats to shop-primed metal surfaces.
4. Surface finish schedule.

B. Related Work:

1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
2. Materials and items which receive: Respective Sections.
3. Factory finished items: Respective Sections.

C. Definitions:

1. DFT: Abbreviation for dry film thickness. The minimum thickness to be applied.
2. Paint: A collective general reference to include materials of every component for finishing systems of every type, and preparation of surfaces for and application of said materials.
3. Rough-Surface Wood: Rough-sawn, re-sawn, or sandblasted woods.

1.02 SUBSTITUTIONS

Only written approval of the Architect, will permit substitutions for materials specified. Refer to Sections 01 25 13 - Product Options and Substitutions.

1.03 QUALITY ASSURANCE

- A. Applicator: Company specializing in commercial painting and finishing with five (5) years experience, and approved by paint manufacturer.
- B. Products shall be V. O. C. compliant with local authorities, South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, current version.
- C. Regulatory Requirements: Conform to applicable code for flame/fuel/smoke rating requirements for finishes.

1.04 SUBMITTALS

- A. Submit according to the provisions of Section 01 33 00.
- B. **All paint must be purchased from the same store, Vista Paint, 173 Village Court, San Dimas, CA 91773, 909-599-7908.**

C. Samples:

1. Number Required: Three each.
2. Paints and Enamels:
 - a. Typical: Each type, in each selected color; 8" x 10" size on stiff smooth material typical; on sandpaper for rough surfaces.
 - b. Stipple Enamel: Each selected color Architect approved, roller texture on 12" x 24" piece of drywall.
3. Stains, Varnishes, Lacquers: Each finish type on each specie and texture of wood; 8" x 10" size for plywood, 16" length for casing or boards, show clearly each step of finishing process.
4. Make samples by same methods to be used to produce actual work. Samples will be examined for color, texture, and workmanship.
5. Remake and resubmit samples when required for approval.

D. Product Data: Complete list of paint materials including compliance with South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, current version; Safe Drinking Water and Toxic Enforcement Act of 1986; Proposition 65, OEHHA.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in sealed containers with manufacturer, brand name, product, and use instructions clearly identified.
- B. Store paint materials at minimum ambient temperature of 45°F and a maximum of 90°F, in well-ventilated area, unless required otherwise by manufacturer's instructions.
- C. Handle to prevent damage during storage and use.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements:
 1. Follow manufacturer's printed recommendations for product when they are more stringent than limits stated herein.
 2. Do not apply materials when temperature is below 50°F or above 110°F.
 3. Do not apply materials when RH is above 90%.
 4. Provide continuous ventilation as necessary to provide air movement, aid drying, and disperse noxious fumes.
 5. Do not apply paint to wet-applied construction until such work is dry, and acceptable to Architect and paint manufacturer.

6. Do not apply exterior paint in rainy, damp, misty, smoggy, or excessively windy weather.
 7. Do not apply paint in areas where dust is being generated.
 8. Provide lighting level of 80 foot-candles measured mid-height at substrate surface during application.
- B. Protection:
1. Cover or otherwise protect finished work of other trades, work not to be painted concurrently, landscaping, and adjacent property from damage.
 2. When not in use, store paints in designated areas. Keep containers closed. At end of day's work, remove empty containers, paint soaked rags, and debris. Vent fumes. Take precautions to prevent fire.
- C. Sequencing, Scheduling:
1. Coordinate removal and replacement of hardware, electrical fixtures and trim, and related work of other Sections.
 2. Stain, prime, back paint, and pre-finish items before installation as required.
- D. Do not use Project plumbing fixtures or piping systems for the following:
1. Cleaning painting equipment and utensils.
 2. Disposal of waste from cleaning or disposal of paints.

1.07 EXTRA MATERIALS

- A. Provide a one-gallon container of each color and surface texture to Owner.
- B. Label each container with color, texture, and room locations, in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers shall verify that their products conform to latest California Air Resources Board regulations.
- B. Materials used in the work of this Section shall be a proprietary brand of one of the following, unless otherwise specified below.
1. **Vista Paint Corporation: 2021 E. Orangethorpe, Fullerton, CA 92831 714-680-3810.**(Preferred Manufacture)

2. ICI Dulux Paints (Ameritone, Glidden, Sinclair); Cleveland, Ohio 800-984-5444.
3. Dunn-Edwards Corp.; Los Angeles, CA; 800-733-3866.

C. Substitutions: Under provisions of Section 01 25 13.

2.02 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Metal Primers:

1. Rust-Inhibitive Primer (For Ferrous Metals):
 - a. Protec Metal Prime (red)9610, Vista Paint Corporation.
 - b. Bloc-Rust Red Oxide Primer 43-4, by Dunn-Edwards.
 - c. Red Oxide Metal Primer #54, by Ameritone.
 - d. Alkyd Metal Primer #4100, by Glidden.
2. General Primer (For Ferrous Metals):
 - a. Protec Metal Prime 9600, Vista Paint Corporation
 - b. Corrobar White Alkyd Primer 43-5, by Dunn-Edwards.
 - c. Devguard 4160, by Devoe.
3. Aluminum and Galvanized Metal Primer (For Non-Ferrous Metals):
 - a. Metal Pro Primer 4800, Vista Paint Corporation.
 - b. Galv-Alum Primer 43-7, by Dunn-Edwards.
 - c. Devguard 4120, by Devoe.
 - d. Coor-Tect #34, by Sinclair.

B. Wood Primers and Sealers:

1. Water-Base Primer (Exterior & Interior):
 - a. Uniprime 4000, Vista Paint Corporation
 - b. E-Z Prime, W708, by Dunn-Edwards.
 - c. 2000-1200 Primer, by ICI Paints.
2. Alkyd Primer (Exterior & Interior):
 - a. Prime-ZALL 8000, Vista Paint Corporation
 - b. Cover-Stain Primer, 03500 Series, by Zinsser.
 - c. Kilz Oil-Base Primer Sealer by Masterchem Industries.
3. Pigmented Shellac Primer: Bin Shellac Base Primer Sealer, by Zinsser.
4. Sanding Sealer: MC80-6200 (McCloskey), by Vista Paints Corporation.

C. Masonry Fillers and Sealer:

1. 100% Acrylic Block Filler 018, Vista Paint Corporation
2. Standard Concrete Block Filler: Bloc-Fil W305, by Dunn-Edwards.
3. Heavy Concrete Block Filler: Bloc-Fil W305, by Dunn-Edwards.

D. Latex Enamel Paints:

1. Acrylic Latex Enamel - Semi-Gloss:
 - a. Carefree Semi-Gloss 8400 / Protec Gloss 9900 Vista Paint Corporation.
 - b. Permasheen W901-1, by Dunn-Edwards.
 - c. Dulux Professional Exterior 100% Acrylic, by ICI Paints.
2. Exterior Masonry
 - a. Semi-Gloss, 8400 Vista Paint Corporation.
 - b. Evershield W701-1, by Dunn-Edwards.
 - c. Masonry Flat Finish, 2220, by ICI.

E. Polyurethane Coatings:

1. Polytec Clearcoat 87C, Vista Paint Corporation
2. Water-Base Polyurethane, Satin Finish:
 - a. MC8-6841 (McClosky 6841 Series), by Dunn-Edwards.
 - b. 1802, by ICI Paints.
3. Deftthane Polyurethane Oil Base, Deft.
4. Solvent-Base Polyurethane, Gloss Finish: Interthane 990HS, by International Protective Coatings, Houston, TX: 713-682-1711.

F. Polytec Gloss 8900, Vista Paint Corporation.

1. Solvent-Base Epoxy Paint: Interseal 670HS, by International Protective Coatings, Houston, TX; 713-682-1711.

G. Fence Primer and Paint:

1. Galvanized Chain Link Posts and Fencing and Wire Fabric.
 - a. Polytec Primer, 8600
 - b. Protec Satin 9700
2. Prefinished Decorative Metal Fence
 - a. Polytec Primer, 8600
 - b. Protec Semi-Gloss 9800

2.03 MATERIALS

- A. Each material type to be same manufacturer throughout. Materials in a coating system to be by a single manufacturer.
- B. Ready mixed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
- C. Coatings shall have good flow and brushing properties; capable of drying or curing free of streaks or sags.

- D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.04 MIXES

- A. Follow manufacturer's printed recommendations.
- B. Mix paints thoroughly prior to application.
- C. Mix only in Inspector's presence, in assigned spaces.
- D. Except where thinning is specifically recommended by manufacturer, do not thin products.

2.05 FINISHES

- A. Refer to schedule at end of Section for surface finish schedule.
- B. Colors:
 - 1. As selected by Architect, from Manufacturer's standard and custom colors and finish selection charts.
 - 2. A number of colors (8 minimum to 12 maximum) will be selected, arranged in various combinations, used to accent trim and other architectural features, and colors and combinations will vary from exterior-to-interior, space-to-space, surface-to-surface, material-to-material, and feature-to-feature.
 - 3. Colors to be factory mixed, and to match approved samples.
 - 4. Tint undercoats sufficiently different so they are readily distinguishable, in any light, from each other and the finish coat.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces for suitability to receive paint. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Plaster and Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.
4. Exterior Located Wood: 19 percent, measured in accordance with ASTM D2016.
5. Concrete Floors: 7 percent.

D. Beginning of installation means acceptance of existing surfaces.

3.02 PREPARATION - NEW SURFACES

A. General:

1. Remove all manufacturer's labels, tags, electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
2. All specified products are to be stored, handled, and used per manufacturer's printed instructions and recommendations.
3. Correct all surface defects, which may adversely affect the finished work.
4. Clean all surfaces prior to sealer or primer application. Surfaces to be free of all loose coating, dust, corrosion and other foreign matter.

B. Metal:

1. Shop Primed Structural Steel:
 - a. Thoroughly clean all surfaces utilizing SSPC-SP No. 2 Hand Cleaning or SSPC-SP No. 3 Power Brush Cleaning method.
 - b. Sand all rough areas to provide smooth, uniform surface. Spot prime abraded, damaged, and unprimed areas with Rust Inhibitive Primer.
2. Shop Primed Non-Structural Steel:
 - a. Thoroughly clean all surfaces.
 - b. Sand all rough areas to provide smooth, uniform surface. Spot prime abraded, damaged, or unprimed areas with Rust Inhibitive Primer.
3. Galvanized Steel:
 - a. Thoroughly clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
 - b. Etch all surfaces with application Krud Kutter Metal Etch Distributed by Vista Paint Corporation solution as follows. Thinning: Use water. Do not reduce solution beyond three parts water to one part Galv-Etch. Application: Brush or mop apply in a thin even coat. After five minutes, remove excess solution with rags, squeegee or sponge. Drying Time: 1/2 hour minimum and 4 hours maximum before priming.
4. Galvanized Chain Link Fence:

- a. Thoroughly power wash and clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
 - b. Lightly sand posts.
 5. Drinking Fountain Steel Pipe Guardrails (Powder Coating): Chemical conversion coating or sand blast all surfaces per Powder Coating manufacturer's printed guidelines.
- C. Wood Work:
1. Painted Wood:
 - a. Thoroughly clean all surfaces.
 - b. Seal knots, pitch spots and resinous areas with Pigmented Shellac Primer.
 - c. Fill all nail and screw holes, open joints, cracks and defects with putty. Install putty after prime coat application. Spot prime all fill areas with Water-Base Primer at exterior locations and Alkyd Primer at interior locations.
 - d. Except for rough sawn lumber and plywood, sand surfaces to a smooth, uniform finish with No. 150 grit sand paper.
 2. Wood with Transparent Finish:
 - a. Thoroughly clean all surfaces.
 - b. Fill all nail and screw holes, open joints, cracks and defects with putty. Putty color to match final finish color.
 - c. Sand to a smooth, uniform finish with No. 220 grit sand paper.
 2. Thoroughly clean all surfaces per coating manufacturer's printed requirements.
- D. Factory Finished Products and Equipment:
1. Remove all incidental adhesive applied labels and label adhesive. Equipment information and data labels and plates to remain.
 2. Thoroughly clean all surfaces with mineral spirits.
 3. Dull glossy paint surfaces by sanding or application of liquid de-glossing surface conditioner.
- E. Factory Finished Decorative Metal Fence:
1. Thoroughly clean all surfaces with mineral spirits.
 2. Dull glossy paint surfaces by sanding or application of liquid de-glossing surface conditioner.
- F. Mildew Treatment: If mildew is present, treat mildew area with spray-on solution of 50% bleach and 50% water. Let surface dry. Spot prime area with Alkyd Primer.
- G. Removal of Grease, Oil and Other Contaminants: Remove oil, grease and similar type contaminants with mineral spirits, ammonia-based

cleaners or trisodium phosphate (TSP) solution. Provide adequate ventilation during use. Allow surfaces to dry prior to primer application.

3.03 PREPARATION - EXISTING SURFACES

A. General:

1. Remove all electrical plates, hardware, light fixture trim and fittings prior to preparing surfaces or finishing.
2. Correct all surface defects which may adversely affect the finished work.
3. Clean all surfaces prior to primer or finish application. Surfaces to be free of all dust, corrosion and other foreign matter.
4. Refer to Paragraph 3.02 for preparation of existing construction not previously finished.

B. Metal:

1. Painted Iron and Steel:
 - a. Power wash all exterior surfaces. Thoroughly clean all interior surfaces.
 - b. Remove all loose, peeling or chalky paint and rust by scraping, hand brushing, power brushing, sanding and/or grit blasting to expose bare metal. Smooth exposed paint edges by sanding. Spot prime exposed metal surfaces with Rust Inhibitive Primer or General Metal Primer. Spot prime exposed galvanized surfaces with Galvanized Metal Primer. Primers to be applied same day that metal is exposed.
 - c. At depressions and dents in steel hollow metal doors, door frames and window frames sand area completely and fill depression or dent with body filler. Prime body filler areas with Rust Inhibitive Primer or General Metal Primer.
 - d. Sand all rough areas to provide smooth, uniform surface. Dull glossy paint surfaces by sanding or application of liquid deglossing surface conditioner.
2. Galvanized Steel/ Chain Link Fencing and Wire Fabric Posts:
 - a. Thoroughly power wash and clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
 - b. Etch all surfaces with application Krud Kutter Metal Etch Distributed by Vista Paint Corporation solution as follows. Thinning: Use water. Do not reduce solution beyond three parts water to one part Galv-Etch. Application: Brush or mop apply in a thin even coat. After five minutes, remove excess solution with rags, squeegee, or sponge. Drying Time: 1/2 hour minimum and 4 hours maximum before priming.
3. Pre-Finished Decorative Metal Fence:

- a. Thoroughly power wash and clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
 - b. Etch all surfaces with application Krud Kutter Metal Etch Distributed by Vista Paint Corporation solution as follows. Thinning: Use water. Do not reduce solution beyond three parts water to one part Galv-Etch. Application: Brush or mop apply in a thin even coat. After five minutes, remove excess solution with rags, squeegee, or sponge. Drying Time: 1/2 hour minimum and 4 hours maximum before priming.
 4. Aluminum: Thoroughly clean all surfaces.
- C. Wood Work:
1. Painted Wood:
 - a. Power wash all exterior surfaces. Thoroughly clean all interior surfaces.
 - b. Remove all loose, peeling or chalky paint by scraping and/or sanding. Smooth paint edges and remove weathered wood to expose sound wood surface by sanding. Spot prime exposed wood areas with Water-Base Primer at exterior locations and Alkyd Primer at interior locations.
 - c. Fill all holes, scratches, depressions, and cracks with putty.
 - d. Sand all rough areas to provide smooth, uniform surface. Dull glossy paint surfaces by sanding or application of liquid deglossing surface conditioner.
 2. Wood with Varnish or Lacquer Finish to be Painted (Interior):
 - a. Thoroughly clean all surfaces.
 - b. Fill all holes, scratches, depressions, and cracks with putty.
 - c. Sand all rough areas to provide smooth, uniform surface. Sand all surfaces with No. 150 grit sand paper.
 3. Wood with Varnish or Lacquer Finish to be Re-Coated (Interior):
 - a. Thoroughly clean all surfaces.
 - b. Repair all damaged areas.
 - c. Fill all holes, scratches, depressions, and cracks with putty. Color of putty to match wood color.
 - d. Sand all rough areas to provide smooth, uniform surface. Sand all surfaces with No. 220 grit sand paper.
 4. Deteriorated, Rotted or Insect Damaged Wood: Replace all deteriorated, rotted, and insect damaged wood with wood type matching existing wood. Refer to Section 06 10 00 - Rough Carpentry and Section 06 20 00 - Finish Carpentry for replacement wood requirements. Prepare replacement wood per Paragraph 3.02, C.

- I. Mildew Treatment: If mildew is present treat mildew area with spray-on solution of 50% bleach and 50% water. Let surface dry. Spot prime area with Alkyd Primer.
- J. Removal of Grease, Oil, and Other Contaminants: Remove oil, grease and similar type contaminants with mineral spirits, ammonia-based cleaners or trisodium phosphate (TSP) solution. Provide adequate ventilation. Allow surfaces to dry prior to primer application.

3.04 PROTECTION

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

3.05 APPLICATION

- A. Workmanship:
 - 1. Execute work with skilled craftsmen.
 - 2. Evenly apply coats, with suitable equipment, well flowed on, free of laps, runs, skips, dead spots, and other imperfections. Last coat to present a uniform surface, color, and texture.
 - 3. Stipple texture to be as approved by Architect.
 - 4. Apply products in accordance with manufacturer's instructions if more stringent than limits specified herein.
 - 5. Do not apply finishes to surfaces that are not dry.
- B. Equipment: Brushes, rollers, and spraying equipment as required and suitable for material being applied; keep clean and in proper operating condition. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- C. General:
 - 1. Paint and color areas per Architect's Color Schedules.
 - 2. All existing wood surfaces to be sanded prior to painting.
 - 3. Mask and cut-in as required to accomplish the various color combinations. Make edges of paint clean and sharp (no overlaps) where they adjoin other colors or materials.
 - 4. Mask all casework hardware.

5. Paint entire surfaces, parts, and items including reveals, returns, rabbets, soffits, projections, openings, and ornamental features.
 6. Allow applied coat to dry within paint manufacturer's recommended limits before next coat is applied.
- D. Number of Coats:
1. Specified number is the minimum number to be applied.
 2. Contractor shall, at his expense, apply additional coats as directed by Architect if:
 - a. Contractor does not produce full even coverage.
 - b. Contractor does not meet required dry film thickness with specified number of coats.
 - c. Contractor applies a coat before Inspector has examined previous coat.
- E. Dry Film Thickness stated in Schedule of Paint Finishes must be increased to manufacturer recommended thickness when such exceeds the thickness stated herein.
- F. Minimum drying time between coats shall be the most stringent of the following conditions:
1. Until coat is dry.
 2. Manufacturer's printed recommendations.
 3. Three (3) days for exterior work, two (2) days for interior work, except where other time requirements are specifically stated in manufacturer's printed recommendations.
- G. Preparation Work Between Coats: Prepare each coat to receive succeeding coat.
1. General: Repair defects, sand, dust, wipe clean.
 2. Wood, Enameled: When dry, lightly sand smooth.
 3. Wood, Varnished or Lacquered: When dry, steel wool smooth.
 4. Plaster and Concrete: Neutralize suction spots or hot spots; then touch-up so coat surface is uniform.
- H. Back-Priming:
1. Immediately upon delivery to Project site, back prime surfaces which will be concealed after installation for following items: Exterior and interior finish lumber and millwork, doorframes, trim, plywood wall lining and paneling.
 2. Painted and Enameled Work: One coat clear sealer.
 3. Wood with Stained Finish: One coat linseed oil.
 4. Keep back-priming off exposed faces.

- I. Priming:
 - 1. General: Prime work as soon as possible after surfaces are prepared.
 - 2. Ungalvanized Steel: Prime immediately after cleaning, on the same day.
 - 3. Galvanized Sheet Metal: Prime immediately after erection.
 - 4. Exterior and Interior Woodwork: Prime immediately after erection.
 - 5. At Glazing: Paint glass beads, stops and rabbets, except for aluminum.
- J. Application Methods: Apply by brush or roller, except as listed below.
 - 1. Enamel to Doors: Roller only.
 - 2. Enamel: Roller typically.
 - 3. Stipple Enamel: Roller only, with Architect approved texture.
 - 4. Varnish or Lacquer: Spray.
 - 5. Exterior Wood Stains: Apply by brush or roller only. Work well into surface, especially on rough-surface woods.
 - 6. Chain Link Fence: Spray.
 - 7. Decorative Metal Fence: Spray.
- K. Doors: Finish faces, edges, top, and bottom. On wood doors, apply first coat to all parts at the same time. At exterior doors, paint interior face with same material used on the exterior face.
- L. Colors: Make color changes at inside corners typically. Paint to a clean straight line.

3.06 PAINTING OF MECHANICAL AND ELECTRICAL ITEMS AND EQUIPMENT

- A. Painting of factory finished items and equipment is not required unless specifically called out herein or on the drawings.
- B. Paint the following:
 - 1. Interior exposed mechanical pipes ductwork, hangers, brackets, collars, and supports.
 - 2. Interior surfaces of ductwork that are visible through grilles, registers, and louvers. Paint flat black. Paint exposed to view dampers behind grilles, registers, and louvers to face grilles, register, or louver color.
 - 3. Exposed plumbing piping, hangers, fasteners, and supports visible from the ground.
 - 4. Interior exposed electrical conduit, boxes, hangers, fasteners, and supports visible from the ground.

5. Electrical panel and telephone backboards. Paint both sides and all edges of backboards. Painting to occur prior to equipment installation.
 6. All unfinished mechanical and electrical items and equipment.
 7. All primed mechanical and electrical items and equipment.
- C. Do not paint equipment nameplates, identification information, and/or labels.
- D. Refer to Division 15 for pipe identification requirements.

3.07 FIELD QUALITY CONTROL

- A. Notify Inspector of Record (IOR) when work is ready for examination. Examination of work shall occur at the following stages:
1. Surface preparation, prior to application of prime coat.
 2. Each coat, prior to application of succeeding coat.
 3. Final coat, and finished work.
- B. Do not proceed with next operation until required examination has been made.

3.08 ADJUSTING AND CLEANING

- A. Cleaning:
1. Clean surfaces as work progresses.
 2. Remove paint spillage and droppings, and stains promptly.
 3. Do not use tools or cleaners, which will mar finish of item being cleaned.
 4. Leave work and paint storage area clean and free of unnecessary accumulation of tools, equipment, surplus materials, and debris resulting from this work.
- B. Correction of Defective Work:
1. Repair abraded, damaged, or incomplete paint surfaces by methods acceptable to Architect. Spot repairs to be well blended into adjacent work. For large repairs, re-coat entire plane or building element in which damaged area occurs.
 2. Defaced surfaces of work not to be painted, shall be cleaned and their original finish restored.
- C. Collect cotton waste, cloths, and material, which may constitute a fire hazard. Place in closed metal containers and remove daily from site.

3.09 SCHEDULE OF PAINT FINISHES - NEW SURFACES

- A.. Metal:

1. Shop Primed Structural Steel (Exposed on Building Exterior):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
2. Shop Primed Structural Steel (Exposed on Building Interior):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
3. Shop Primed Non-Structural Steel (unless noted otherwise):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
4. Shop Primed Metal Doors:
 - a. Coat 1: Acrylic Latex Enamel, Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Gloss.
 - c. Total DFT: 3.0 mils.
5. Shop Primed Metal Door Frames:
 - a. Coat 1: Acrylic Latex Enamel, Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Gloss.
 - c. Total DFT: 3.0 mils.
6. Galvanized Metal:
 - a. Coat 1: Galvanized Metal Primer. Apply Coat 1 within 4 hours of preparation work completed.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
 - d. Total DFT: 5.0 mils.
7. Galvanized Chain Link Fence:
 - a. Coat 1: Multi-Purpose Primer.
 - b. Coat 2: Alkyd Polyurethane, Satin
 - c. Coat 3: Alkyd Polyurethane, Satin
 - d. Total DFT: 3.0 mils.
8. Factory Finished Products and Equipment (See Respective Specification Sections).
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
9. Factory Finished Decorative Metal Fence:
 - a. Coat 1: Multi-Purpose Primer.
 - b. Coat 2: Alkyd Polyurethane, Satin.
 - c. Coat 3: Alkyd Polyurethane, Satin.
 - d. Total DFT: 3.0 mils.
10. Visible Roof-Top Equipment: Paint per requirements of Factory Finished Products and Equipment or per Metal type.

11. Gas Piping:

- a. Coat 1: Rust Inhibitive Primer.
- b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
- c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
- d. Total DFT: 5.0 mils.

B. Wood Work:

1. Wood Work (Exterior):

- a. Coat 1: Alkyd Primer.
- b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
- c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
- d. Total DFT: 4.5 mils.

2. Millwork (Interior, Paint Finish):

- a. Coat 1: Alkyd Primer:
- b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
- c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
- d. Total DFT: 4.5 mils.

3. Doors and Door Frames (Interior, Paint Finish):

- a. Coat 1: Alkyd Primer:
- b. Coat 2: Acrylic Latex Enamel, Gloss.
- c. Coat 3: Acrylic Latex Enamel, Gloss.
- d. Total DFT: 4.5 mils.

4. Doors, Casework, and Millwork (Interior, Transparent Finish):

- a. Coat 1: Oil Stain.
- b. Coat 2: Sanding Sealer, Light sand with No. 220 sand paper.
- c. Coat 3: Water-Base Polyurethane, Satin.
- d. Coat 4: Water-Base Polyurethane, Satin.
- e. Total DFT: 3.0 mils.

5. Painted Plywood Back Board at Electrical Equipment:

- a. Coat 1: Fire Retardant Coating. 150 SF per gallon.
- b. Coat 2: Fire Retardant Coating, 150 SF per gallon.

3.10 SCHEDULE OF PAINT FINISHES - EXISTING SURFACES

A. General:

- 1. Refer to Paragraph 3.09 for required paint finishes on existing unpainted materials, products and equipment.
- 2. Existing surface mounted conduit and electrical boxes on surfaces called out to be painted are to be painted also.
- 3. Existing air distribution diffusers and returns on surfaces called out to be painted are to be painted also.

B. Metal:

1. Previously Painted Steel:
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
 2. Previously Painted Metal Doors:
 - a. Coat 1: Acrylic Latex Enamel, Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Gloss.
 - c. Total DFT: 3.0 mils.
 3. Previously Painted Metal Door Frames:
 - a. Coat 1: Acrylic Latex Enamel, Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Gloss.
 - c. Total DFT: 3.0 mils.
 4. Galvanized Metal:
 - a. Coat 1: Galvanized Metal Primer. Apply Coat 1 within 4 hours of Preparation work completion.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
 - d. Total DFT: 5.0 mils.
 5. Galvanized Chain Link Fence:
 - a. Coat 1: Multi-Purpose Primer.
 - b. Coat 2: Alkyd Polyurethane, Satin
 - c. Coat 3: Alkyd Polyurethane, Satin
 - d. Total DFT: 3.0 mils.
 6. Aluminum:
 - a. Coat 1: Aluminum Primer.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss. Apply Coat 2 within 48 hours of Primer application.
 - c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
 - d. Total DFT: 5.0 mils.
 7. Factory Finished Decorative Metal Fence
 - a. Coat 1: Multi-Purpose Primer.
 - b. Coat 2: Alkyd Polyurethane, Semi-Gloss
 - c. Coat 3: Alkyd Polyurethane, Semi-Gloss
 - d. Total DFT: 3.0 mils.
- C. Wood Work:
1. Previously Painted Items (Exterior):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
 2. Previously Painted Casework, and Millwork (Interior):
 - a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Total DFT: 3.0 mils.
 3. Previously Painted Door and Door Frames (Interior & Exterior):

- a. Coat 1: Acrylic Latex Enamel, Gloss.
- b. Coat 2: Acrylic Latex Enamel, Gloss.
- c. Total DFT: 3.0 mils.
- 4. Previously Varnished or Lacquer Finished Casework and Millwork (Interior to be Painted):
 - a. Coat 1: Alkyd Primer.
 - b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
 - c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
 - d. Total DFT: 4.0 mils.
- 5. Previously Interior Transparent Finished Doors, Casework, and Millwork (Re-Coat):
 - a. Coat 1: Water-Base Polyurethane, Satin.
 - b. Coat 2: Water-Base Polyurethane, Satin.
 - c. Total DFT: 2.0 mils.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work may include the following signs, refer to Drawing for signage requirements:
 - 1. Plastic Signs:
 - a. International accessibility symbol signs.
 - b. Room capacity signs.
 - c. Exit signs, unlighted.
 - d. Room identification signs.
 - 2. Metal Signs:
 - a. International accessibility symbol signs.
 - b. Accessible parking entrance signs.
- B. Related Work:
 - 1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.

1.02 SUBSTITUTIONS

Only written approval of Architect, by Addenda or Change Order, will permit substitutions for materials specified. Refer to General Conditions and Section 01 25 13 - Product Options and Substitutions for procedure.

1.03 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies; Codes:
 - 1. State Fire Marshal, Title 19.
 - 2. California Building Code current Edition (CBC).
 - a. All signage shall conform to CBC Sections 11B-703.
 - b. Tactile exit signage shall be provided per current CBC Section 1011.4.
 - 3. Conform to State Regulations for standard Accessibility sign.
 - 4. Refer to Drawings for additional standards and graphics.

1.04 DESIGN REQUIREMENTS

Signage and graphics:

Raised characters shall comply with **CBC Section 11B-703.2**:

- **Depth:** It shall be 1/32 inch (0.8 mm) minimum above their background and shall be sans serif uppercase and be duplicated in Braille.
- **Height:** It shall be 5/8 inch (15.9 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter "I". **CBC Section 11B-703.2.5**
- **Finish and contrast:** Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background. **CBC Section 11B-703.5.1**
- **Proportions:** It shall be selected from fonts where the width of the uppercase letter "O" is 60 % minimum and 110 % maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15 % maximum of the height of the character. **CBC Sections 11B-703.2.4 and 11B-703.2.6**
- **Character Spacing:** Spacing between individual raised characters shall comply with **CBC Section 11B-703.2.7 and 11B-703.2.8**
- **Format:** Text shall be in a horizontal format. **CBC Section 11B-703.2.9**

- **Braille:** It shall be contracted (Grade 2) and shall comply with **CBC Sections 11B-703.3 and 11B-703.4**. Braille dots shall have a domed or rounded shape and shall comply with **CBC Table and Figure 11B-703.3.1**.
- **Mounting height:** Tactile characters on signs shall be located 48" minimum to the baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. **CBC Section and Figure 11B-703.4.1**
- **Mounting location:** A tactile sign shall be located per **CBC Section and Figure 11B-703.4.2** as follows:
 - alongside a single door at the latch side.
 - on the inactive leaf at double doors with one active leaf.
 - to the right of the right hand door at double doors with two active leaves.
 - on the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leaves.
 - so that a clear floor space of 18" x 18" minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

- B. Type Imagery:
1. Type style: Sans Serif upper case.
 - a. Letter Size: See signage drawings.
 - b. Number Size: See signage drawings.
 - c. Raised Letters: Letters shall be raised a minimum of 1/32" above background.
 - d. Other Sizes: As specifically indicated.
 2. Arrangement: Use standard spacing between letters, words, numbers and lines; center text.
- C. Symbol Style: Recognized standard International Symbols of Accessibility, such as those developed by the American Institute of Graphics, for the U. S. Department of Transportation.
1. Accessible Restrooms shall include a 6" high wheelchair logo. Logo shall be raised a minimum of 1/32" above the background.
 2. On visual signs, characters and symbols shall be sized according - to view distance. Signs mounted 80" or more AFF shall have minimum 3" high characters.
 3. Pictographs and ISA's (International Symbol of Accessibility) on interior signs at eye level, shall be minimum 3 " high or twice as high as the height of text on the sign; whichever is greater. On signs where bottom is 72" or more AFF, minimum height shall be 6" or twice as high as the largest text on the signs; whichever is greater.
- D. Colors:
1. Background Colors: As selected by the Architect from manufacturer's standard color range (12 colors maximum); one color maximum, typically.
 2. Type Imagery: White or black, as selected by Architect to contrast with background colors; one color maximum, each, for interiors and exteriors.

3. Code Required Colors for Symbols and Signs: Where colors are mandated by Codes or Regulations conform to their requirements.
4. Other colors: Certain colors are specifically noted.

1.05 SUBMITTALS

- A. Samples: Provide full-size, with colors, materials, graphics and type imagery as specified herein. Provide one sign of each type, for approval by the Architect.
- B. Product Data: Four (4) copies of manufacturer's standard brochure describing all items and materials, including manufacturer's standard color range.
- C. Shop Drawings: Reference shop drawings to Architect's Drawings and mark numbers. Shop drawings shall list sign styles, lettering and locations. Submit four (4) copies.

1.06 PROJECT CONDITIONS

- A. Verify type of supporting construction; provide suitable attachments.
- B. Room Identification Signs: Coordinate with installation of other door-mounted identifying devices.
- C. Do not install adhesive applied signs when ambient temperature is below 70°F. Maintain this minimum during and 24 hours after, installation of signs.

PART 2 - PRODUCTS

2.01 PLASTIC SIGNS

- A. Manufacturers:
 1. SIGNS and Lucite Products, Inc.: 2721 Kimball Avenue, Pomona, CA 91767; (909) 621-7447.
 2. Acceptable Manufacturers:
 - a. Architectural Sign/Identity, 1247 South Buena Vista St., San Jacinto, CA 951-654-4350.
 - b. Best Manufacturing, Montrose, Colorado; 800-235-2378.
 - c. Mohawk Sign Systems Inc.; P.O. Box 966, Schenectady, NY 12301; 800-223-7708 or approved equivalent.
- B. Materials:
 1. Plastic Sign Material:
 - a. Type: Phenolic Resin Core with a three-ply melamine resin surface.
 - b. Thickness: 1/8".
 2. Adhesive: Pressure sensitive, hi-tack transfer tape with peel-back paper backing. Structural grade silicone adhesive for mounting on glazing.
 3. Mounting Screws: Non-corrosive, tamperproof screws. Match finishes to the door hardware for the door where the signs are mounted.
 4. Signs shall be non-static, fire retardant, and self-extinguishing.

- C. Manufacturing Specifications:
1. Material thickness: 1/8".
 2. Standard sheet size: 48" x 96".
 3. Weight: 1/8" = 1 lb/ square foot.
 4. Maximum continuous operating temperature: 225°F (107°C).
 5. Flexural strength flat: 21,497 psi.
 6. Tensile strength: 22,000 psi.
 7. Shear strength: 22,729 psi.
 8. NEMA rated "self-extinguishing".
- D. Graphic Process and Fabrication: All signs shall be manufactured using "Sand-Etched Process" or equivalent system, as per acceptable manufacturers stated methods, whereby characters are integral part of signage body.
1. Tactile characters shall be raised the required 1/32" from sign face. Glue-on letters, images and/or symbols are not acceptable.
 2. Work to have sharp clean profiles.
 3. Text shall be accompanied by Contracted Grade 2 Braille. Braille shall be separated 3/8" min. and 1/2" max. from corresponding raised characters or symbols.
 4. Perimeter borders shall be 3/8" minimum.
 5. Edges: Finish edges smooth and clean, without chips or burrs.
 6. Corners: Provide radius corners; 1/8" diameter.
 7. Cut-outs For Hardware: Factory made, accurately, to templates.
 8. Mounting Holes: Factory drilled.
 9. Adhesive Backing: Completely cover rear surface of each sign.
- E. Room Identification Signs:
1. Refer to Drawings for names, numbers, identification symbols, sizes, configurations, and locations.
 2. Colors for Type Imagery:
 - a. Room Name Signs:
 - 1) Type: Black or white, to be selected by Architect.
 - 2) Background: One color to be selected by the Architect from manufacturer's standard color range (12 colors, minimum) for interior signs, unless otherwise noted. Refer to signage schedule.
 - b. Room Number Signs:
 - 1) Type: Black or white, to be selected by Architect.
 - 2) Background: One color to be selected by the Architect from manufacturer's standard color range (12 colors, minimum) for interior signs, unless otherwise noted. Refer to signage schedule.
 - c. Architect shall select a second color for signs located on exterior.

F. Accessibility Symbol Signs:

1. Refer to Drawings for identification symbols, sizes, configuration, and locations.
2. Figure Symbols for Building Entrance Signs:
 - a. Size: 6" x 6", typically.
 - b. Refer to Drawings.
3. Geometric Symbols for Toilet Rooms:
 - a. For Men/Boys: An equilateral triangle, 10" on a side; 1/8" thick.
 - b. For Women/Girls: A 12" diameter circle; 1/8" thick.
 - c. For Both Sexes: An equilateral triangle, 10" on a side, inlaid in 12" diameter circle; 1/8" thickness.
4. Directional Signs.
5. International Symbol for Access for the hearing impaired.
6. Colors for Symbols:
 - a. International Accessibility Symbols:
 - 1) Symbols: White.
 - 2) Background: Blue, Color No. 15090 per Federal Standard 595B.
 - b. Male and Female Symbols:
 - 1) Symbols: Blue.
 - 2) Background: White.

G. Room Capacity Signs:

1. Wording for sign at Assembly Rooms: See Plans and Signage drawings. Number to be on Drawings or provided by Architect.
2. Refer to Drawings for identification.

2.02 EXIT SIGNS; FLOOR LEVEL, SELF-LUMINOUS

A. General:

1. Conform to State Fire Marshal, Title 19.
2. UL listed 924 Floor-level exit signs.
3. UL listed 1994 floor-level exit markers and exit path marking.
4. ICC No. ESR-14-09.

B. Refer to Drawings for identification, symbols, sizes, configuration, and location.

C. Mounting Locations: Single-face for flat-to-wall mounting.

D. Acceptable Manufacturer and Product: Active Safety; Murray, Utah; 800-657-6324; Model #16.000 SWMA stencil-faced Exit Marker, or approved equivalent.

2.03 METAL SIGNS

A. Materials: Reflectorized sign shall be porcelain on steel with beaded text, galvanized steel post, and concrete footing.

- B. International Accessibility Symbol Signs:
 - 1. Types:
 - a. Accessible Parking Stall Signs.
 - b. Building Entrance Signs.
 - 2. Refer to Drawings for identification symbols, size, configuration, and locations.
- C. Accessible Parking Entrance (Tow-Away) Signs: Refer to Drawings for size, text, configuration, and locations.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts existing surfaces.

3.02 PREPARATION

Layout: Accurately lay out work to maintain proper lines, levels and spacing.

3.03 INSTALLATION

- A. Mounting:
 - 1. Press tape firmly to mounting surface, and secure each plaque or sign with minimum two screws.
 - 2. When mounting on glazing, press silicone adhesive firmly to glazing. Clean excess adhesive from glazing.
- B. Signs Mounted at Doors:
 - 1. Mount following signs on room doors.
 - a. Toilet Rooms: Accessibility geometric symbol signs. Mount with centerline of sign 60" above finish floor.
 - 2. Mount following signs or plaques adjacent to latch-side of doors:
 - a. Room Accessibility Sign.
 - b. Room Identification signs mounted with centerline of sign 60" A.F.F.
 - c. Room Capacity Signs: Mount on wall in visible location as directed by the Architect.
 - d. Exit Signs, self-luminous: Mount on wall adjacent to the exit.

3.04 SCHEDULE

- A. Plastic Accessibility Symbol Signs:
 - 1. Figure Symbols (Building Entrance Signs, Directional Signs and International Symbol of Access for the Hearing Impaired): Locate where indicated on the Drawings.
 - 2. Geometric Symbols (Toilet Room Signs): Locate one for each Accessible Toilet Room.

- B. Room Capacity Sign: Locate one sign in Assembly Room at Multi-Purpose Building, and where indicated on Drawings.
- C. Exit Signs (self-luminous): Locate at each exit door to the exterior and at each interior door when an exit light is shown.
- D. Metal Accessibility Symbol Signs:
 - 1. Accessible Parking Stall Signs: Locate where indicated on the Drawings.
 - 2. Building Signs: Locate where indicated on the Drawings.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Furnish labor, materials, tools, and equipment to install plumbing systems as indicated.
- C. Related Sections:
 - 1. Section 23 05 00: Basic Mechanical Requirements.
 - 2. Section 23 05 13: Basic Mechanical Materials and Methods.
 - 3. Section 23 05 48: Mechanical Sound, Vibration and Seismic Control.
 - 4. Section 23 05 53: Mechanical Identification.
 - 5. Section 23 07 00: Mechanical Insulation.
 - 6. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.
 - 7. Division 26: Electrical.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.

1.03 QUALITY ASSURANCE

- A. Unless otherwise noted, provisions including amendments thereto, of the State Plumbing Code Part 5, Title 24, CCR; of the Uniform Plumbing Code, latest edition; and of the latest Plumbing Ordinances of the City of Fontana and County of San Bernardino are hereby made part of this section.
- B. Conform to provisions of Section 15010: Basic Mechanical Requirements.
- C. Manufacturer of plumbing products shall obtain ANSI/NSF Standard 61, Section 9 certification to demonstrate compliance with the federal requirements for lead contribution to drinking water (Safe Drinking Water Act SDWA).

1.04 PRODUCT HANDLING

- A. Conform to provisions of Section 15050: Basic Mechanical Materials and Methods.

PART 2 - PRODUCTS

2.01 PIPING SYSTEMS

- A. Materials: Refer to Section 15050: Basic Mechanical Materials and Methods.
- B. Insulation for Piping: Refer to Section 15080: Heating and Air Conditioning Piping Systems.

2.02 PIPE HANGERS

- A. Refer to Section 15050: Basic Mechanical Materials and Methods.
- B. Schedule Numbers:
 - 1. PH-1: Complete with clamps, inserts, etc.

SUPERSTRUT	UNISTRUT	B-LINE
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- 2. PH-2: In shower area.
 - a ACORN 7116 or 7118 series, or equal.

2.03 P-TRAPS

- A. Schedule Numbers:
 - 1. PT-1: Cast brass complete, chrome-plated.

ZURN	Z-8712-LC
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PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General:
 - 1. Unless otherwise specified, plumbing fixtures, equipment and appliances that require connections to plumbing line shall be connected. This shall include fixtures specified or indicated as furnished by others, furnished by Owner, or specified in another section. Install supplies, stops, valves, traps, wall flanges, or pipe casing for connection of this equipment.

2. Install equipment as indicated on reviewed Shop Drawings.
 3. Avoid interference with Work of other trades. Do not deviate from Drawings without review of the Architect.
- B. Examination: Check each piece of equipment in system for defects verifying that parts are properly furnished and installed.
- C. For piping Work, refer to Section 15050: Basic Mechanical Materials and Methods.

3.03 CONDENSATE DRAINS FROM AIR CONDITIONING UNITS

- A. Connect drain piping from drain pan of air conditioning unit to dry well or floor sink. When coil or unit housing is shock or vibration isolated, connection shall be furnished through a flexible connector not less than 10 inches long. Drain line shall pitch to flow out at not less than one inch in 8 feet. Drain line size shall be per UPC (3/4 inch up to 3 ton only). The drain line shall not be reduced smaller than the unit outlet connection
- B. Condensate drain piping installed within building whether in air conditioned space or not shall be insulated. Refer to Section 15080: Mechanical Insulation, for type of material required.
- C. Condensate Trap:
1. A condensate trap shall be installed for each air conditioning coil. The trap shall be assembled from 2 brass unions: one between the A/C unit and the inlet of the trap, and one at the outlet of the trap that connects to the main drain.
 2. Trap configuration shall be per manufacturer's recommendations based on total unit casting static pressure (simulated plugged filter condition), but not less than 3 inch water seal.
 3. Running trap design is not permitted.
 4. Secondary drain shall be trapped. Requirements are the same as for primary trap.
- D. Condensate trap shall be checked at equipment operational tests for proper water drainage flow from air conditioning unit. Cooling condensate pan shall be filled with water, filters covered with plastic (plugged filter simulated), unit panels replaced, and unit motor running at design condition. Pan shall drain without hesitation to bottom of inlet connection. Tests are made prior to installation of ceiling.
- E. Secondary Overflow Drain:

1. Drain pan installed underneath air conditioning units in concealed ceiling space or units that incorporate dam fitting shall be furnished with secondary drain piped to outside planter area with outflow location clearly visible.
2. If outside building location is not available or feasible, secondary drains will be piped to a classroom sink, if sink is not available pipe to a room corner away from cabinets, computers and desks.
3. Secondary vertical pipe that penetrates through suspended ceiling shall be furnished with a coupling or threaded adapter so ceiling tile can be removed without damage.

3.04 CONDENSATE DRAINS FROM WINDOW TYPE HEAT PUMP AND EXTERIOR WALL MOUNT HEAT PUMP UNIT

- A. Whether indicated on Drawings or not, window units and wall mount units without built in bottom drain pan for evaporator and condenser coils shall be provided with galvanized steel condensate pan at the bottom of the unit with drain line that drains into drywell. Install copper 1/2 inch diameter pipe for window type air conditioners and 3/4 inch diameter pipe for exterior wall-mounted heat pump units.

3.05 CLEANING - PLUMBING PIPING SYSTEMS AND FIXTURES

- A. Plumbing lines and fixtures shall be flushed to remove dirt and foreign material until water runs clear and no foreign substance or odor is present. Strainers and screens on faucets shall be removed during this cleaning operation.
- B. After satisfactory cleaning of strainer and screen replacements has been witnessed by the Project Inspector, post and maintain signs stating: "CAUTION - Water at this construction Project has not yet been certified for human consumption." Signs shall be furnished with letters at least 1/2 inch in height, and shall be conspicuously posted at entrances to the Project site. Signs shall be paneled, black and yellow, in conformance with OSHA Section 1910.1455.

3.06 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose off the Project site.

3.07 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. This section provides the basic mechanical requirements that apply to the Work of Division 15.
- C. Related Sections:
 - 1. Division 16: Electrical.

1.02 REGULATORY REQUIREMENTS

- A. Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less. Under California regulations pipes and pipe fittings are considered lead-free when they contain 0.25 percent lead or less as defined in California Assembly Bill 1953 (AB 1953). No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25.
 - 1. Provide lead-free water pipe, solder, and flux materials that meet the standards as outlined by the federal SDWA regulations and California AB 1953 if installed in drinking water system.
 - 2. Collect pipe, solder, and flux material samples as required by the PI. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.
 - a. Test samples for lead content by the atomic absorption spectrophotometry method.
 - 3. Materials found not conforming to SDWA and California AB 1953 regulations shall be deemed defective Work and shall be replaced with lead-free materials.

4. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the PI.
- B. Workmanship, materials, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:
1. AMCA - Air Moving and Conditioning Association.
 2. ANSI - American National Standards Institute.
 3. ASME - American Society of Mechanical Engineers.
 - a. Boiler and Pressure Codes.
 - b. Code for Pressure Piping.
 4. ARI - Air Conditioning Refrigeration Institute.
 5. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers.
 6. ASTM - American Society for Testing and Materials.
 - a. ASTM A53 Specification for Welded and Seamless Pipe.
 7. AWA - American Waterworks Association.
 8. CSA - Canadian Standards Association.
 9. FMG - Factory Mutual Global.
 10. IAPMO - International Association of Plumbing and Mechanical Officials.
 11. NFPA - National Fire Protection Association.
 12. OSHA - Occupational Safety and Health Administration.
 13. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Inc.
 14. UL - Underwriters Laboratories.
- C. Workmanship, materials, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:

1. CBC, CMC, and CPC - latest editions including amendments effective on the Effective Date of the Contract.
 2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.
 3. California Building Code (CBC).
 4. OSHA - Occupational Safety and Health Administration.
 5. Department of Health.
 6. South Coast Air Quality Management District.
- D. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.
- E. Permits and Fees: Refer to the General and Supplementary Conditions.

1.03 SUBMITTALS

- A. Provide submittals in accordance with Section 01300 and with specific requirements of Division 15 sections, as applicable.
- B. Submit the following:
1. Complete materials list of items to be furnished and installed under this Division.
 2. Shop Drawings, as required.
 3. Manufacturer's specifications and other Product Data to demonstrate compliance with specified requirements.
 4. Manufacturer's printed installation instructions.
 5. Catalog cut sheets.
- C. After Architect's approval, the above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.
- D. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in AutoCAD may be provided by the Architect to serve as a background for the Shop

Drawings. Shop Drawings shall be in AutoCAD, shall comply with the requirements of Section 01100 Coordination and Section 01300 Submittals and shall indicate at a minimum:

1. Complete system layout of equipment, components, ductwork, and piping, indicating service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger / support locations. All the above items shall be coordinated on the shop drawings according to the requirements of Section 01100.
2. Schedule and description of equipment, ductwork, piping, fittings, valves, dampers, and controllers.

1.04 PROJECT RECORD DOCUMENTS

- A. Comply with provisions of Section 01770: Contract Closeout.
- B. Project Record Drawings:
 1. Provide a complete set mechanical, plumbing, fire protection and control system drawings in AutoCAD, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full-size reproducible plots on vellum and 3 sets of prints.
 2. Before Contract Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.
- C. Operation and Maintenance Manuals:
 1. Submit 2 copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return 3 copies of manuals. Manuals shall be bound in hardback, 3-ring, loose-leaf binders. Deliver manuals to the OAR. Submit an electronic copy of the entire manual in Adobe Acrobat (PDF file) format.
 2. Contents of Manual:
 - a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

- b. Manufacturer's operating instructions including, but not limited to, the following:
 - 1) Identification of components and controls.
 - 2) Pre-start checklist and start-up procedures.
 - 3) Normal operation settings and checklists.
 - 4) Pre-shut down checklist and shut down procedures.
 - 5) Trouble shooting checklist and guidelines.
 - 6) Recommendations for optimum performance.
 - 7) Warnings and safety precautions on improper or hazardous operational procedures or conditions
- c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 15 that includes the following as a minimum:
 - 1) Manufacturer's model, identification and serial numbers.
 - 2) Exploded view of assembly drawings identifying each component or part with the relevant part number.
 - 3) Directory of manufacturer's representatives, service contractors and part distributors.
 - 4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.
- d. Project Record Drawings: Complete set of mechanical, plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.
- e. Test and balance reports: Submit as specified in Section
- f. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as

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required by SCAQMD to allow start-up and operation of equipment.

- g. San Bernardino County industrial waste permits.
- h. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.
- i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 PROTECTION, CARE AND CLEANING

- A. In addition to storage criteria of the General Conditions, and provisions under Section 01500: Construction Facilities and Temporary Controls, the following shall be provided:
 - 1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.
 - 2. Protect installed Work.
 - 3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.
 - 4. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.
 - 5. Do not store plastic pipe or materials in direct sunlight.
 - 6. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.
 - 7. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.
 - 8. Air handling equipment shall not be operated until building is cleaned and air filters are installed.
 - 9. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

10. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.

1.06 COORDINATION

- A. Contract Documents indicate extent and general arrangement of Work under Division 15. Contractor shall coordinate work in accordance with Section 01100 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.
- B. Do not store plastic pipe or materials in direct sunlight.

1.08 PRELIMINARY OPERATION

- A. OAR may require any portion of mechanical Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.
- B. Notify the PI at least 24 hours in advance of lighting or re-lighting pilots.

1.09 TRAINING OF OWNER PERSONNEL

- A. Training of Owner's personnel shall include:
 1. A minimum of 4 hours of on-site overview of the overall Mechanical System.
 2. Refer to Division 15 sections for specific training on each of the components of the Mechanical System.
- B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance,

troubleshooting, and Project site repair of each component, equipment, or system provided under this Contract.

- C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.
- D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by OAR.
- E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the OAR and kept as part of the project documents.

1.10 GUARANTEES AND DAMAGE RESPONSIBILITY

- A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.
- B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.
- C. HVAC equipment products from different manufacturers are never identical. Equipment approved as being equal is interpreted as being equivalent in capacity, performance and quality. The dimensions, weight, configuration and utility requirements could be quite different from the equipment used as the basis of design. Due to these differences, additional coordination and adjustments by the Contractor are required. For the equipment to be deemed truly equal, the additional coordination and adjustments by the Contractor should not incur any additional cost to the Owner and any additional labor to the design team.
- D. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by

authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. All the additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

- E. For substitution of materials or products, refer to the General Conditions.

PART 3 – EXECUTION

3.01 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

- A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and/or facilities.
- B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.
- C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.02 CUTTING, NOTCHING AND BACKING

- A. Conform to California Building Code, Title 24, Part 2, Sections 2308.9.10 and 2308.9.11, for notches and bored holes in wood; Section 1906A.3, for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.
- B. Where pipes or ducts pass through or are located within one inch of any construction element, install a resilient pad, 1/2-inch-thick minimum, to prevent contact.
- C. Furnish all necessary provisions for recesses, chases, accesses, and provide blocking and backing as necessary for proper reception and installation of mechanical Work.

3.03 LOCATION OF PIPING AND EQUIPMENT

- A. Location of piping, apparatus, and equipment as indicated on Drawings is approximate and shall be altered to avoid obstructions, preserve headroom and provide free and clear openings and passageways.
- B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

- C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.
- D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.04 TESTS AND TESTING

- A. Tests shall be as required under the applicable sections of Division 15, including this section.
- B. Tests required by other sections of the Contract Documents include the following:
 - 1. Test and balance of mechanical equipment and systems: Refer to Section 01450: Test and Balance
 - 2. Hydrostatic test of boilers: Refer to Section 01450: Test and Balance
 - 3. Test of smoke and fire detectors: Refer to Division 16: Electrical
- C. Additional tests may be required in the case of products, materials, and equipment if:
 - 1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.
 - 2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.
- D. Piping Tests:
 - 1. Perform tests required to demonstrate that operation of mechanical systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the PI, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.
 - 2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.
 - 3. Pressure gauges furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.
 - 4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a

minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.
6. Refrigerant piping may be tested with a halide detector or calibrated electronic testing equipment.
7. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the PI.
8. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

E. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:
Durham system, glass or plastic acid waste, vent and roof drain (except pipes running under a slab or underground)	Fill with water to top of highest vent, allow to stand two hours, or longer, as required by Inspector. Minimum head required for any joint shall be 10-feet in building.	Water
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10' of water, vertically	
Storm water disposal lines	Running water test	Water
Domestic water piping	200	Water
Gas piping (steel threaded or plastic)	60 (both tests)	Air
Gas piping (steel welded)	100 (both tests)	Air
Gas welding station	1-1/2 Working pressure 100 min.	Dry nitrogen
Refrigeration piping		

R-22	400	Dry nitrogen
R-134a	300	Dry nitrogen
R-401a	300	Dry nitrogen
R-401b	300	Dry nitrogen
R-404a	500	Dry nitrogen

F. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed, recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and/or materials shall be replaced or repaired as required.
2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.
3. Run test the equipment after start-up for five consecutive days. Tests shall include operation of heating, ventilating, and air conditioning equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified heating and cooling capacities. If equipment passes, install new filters. If equipment fails, it shall be adjusted and retested until system meets all applicable codes.
4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

- a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.
 5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.
 6. Provide electric energy and fuel required for tests.
 7. Final adjustment to equipment or systems shall meet specified performance requirements.
 8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.
- G. Specific Coordinated Plan for Test & Balance:
1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.
 2. Prior to final test and balance, mechanical equipment and systems shall be operated and tested as indicated in Article F above to demonstrate satisfactory overall operation of the installed systems.
 3. Immediately before starting tests, air filter media shall be cleaned or renewed. Roll-type filters shall be advanced to provide new clean media. Cleanable type media shall be thoroughly cleaned and re-oiled with new, clean oil as recommended by manufacturer if they are of viscous impingement type. Disposable type filters shall be replaced with new filters. Replaceable media shall be replaced with new media.
 4. An accurate means of measuring air flow and temperatures shall be furnished to balance air supply, return, and exhaust systems so uniform temperatures occur in every room and design airflow is obtained through registers, diffusers, and grilles.
 5. Systems shall be adjusted to provide airflows indicated including maximum fresh air and maximum return air. Dampers shall be checked for proper settings and operation. Air and water inlet and leaving temperatures at coils shall be checked. Complete operational data including airflows, room temperatures, fan speeds, motor currents, plenum, and duct static pressures shall be tabulated.
 6. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with

requirements specified in Section 15050: Basic Mechanical Materials and Methods.

3.05 NOISE AND VIBRATION REDUCTION

- A. Correct noise or vibration caused by mechanical systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level
- B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.06 PROTECTION, CARE AND CLEANING

- A. In addition to storage criteria of the General Conditions, and provisions under Section 01500: Construction Facilities and Temporary Controls, the following shall be provided:
 - 1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.
 - 2. Protect installed Work.
 - 3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.
 - 4. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.
 - 5. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.
 - 6. Air handling equipment shall not be operated until building is cleaned and air filters are installed.
 - 7. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.
 - 8. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date

of element before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.

END OF SECTION 23 05 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
 - 1. This Section prescribes basic materials and methods generally common to the Work of Division 15.
- C. Related Sections:
 - 1. Section 01450: Tests and Balance
 - 2. Section 02318: Excavating, Backfilling and Compacting for Utilities.
 - 3. Division 15: Mechanical.
 - 4. Division 16: Electrical.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01, Section 15010 and specific requirements of each section of Division 15.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with applicable national, state, and local codes and standards: ASTM, ASME, ANSI. Federal Specifications, AWWA, SISPI, NFPA, FM, UL, CPC California Plumbing Code, CMC, CSA.
- B. Qualifications of Manufacturer: Products used in the Work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the Architect.
- C. No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25%.

1.04 COORDINATION

- A. Coordinate related Work in accordance with provisions of Section 01100: Coordination.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.
- B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing codes and applicable standards as specified in Section 15010, manufacturer's instructions or as required.
1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.02 MANUFACTURERS AND MATERIALS

- A. Ball Valves: Bronze, 2 inches and smaller:

NOTE: Ball Valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this specification.

BV-1 Class 150, 600 psi, CWP, 2-piece construction reinforced Teflon seats, Full port, adjustable packing gland, stainless ball and stem, threaded ends.

Hammond 8303A, Nibco T585-7066, Milwaukee BA400S or equal.

- B. Check Valves:

NOTE: Check Valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this specification.

1. Bronze, 2 inches and smaller:

CHV-1 Class 125, 200 CWP swing check, Teflon disc, threaded ends.

NIBCO T-413-Y, Milwaukee 509-T, Hammond IB-940 or equal.

C. Earthquake Valve: (Shall be DSA listed type)

EQV-1 Mechanically triggered by seismic movement, complying with state of California seismic response specifications, UL listed and certified by D.S.A. Size and pressure as required or indicated on Drawings. [(Minimum 1/4 psi, maximum 10 psi)]. Earthquake valve shall shut off gas automatically during an earthquake to prevent an explosion or fire. Valve shall be Koso California seismic valve, or equal.

1. Not sensitive to vibrations caused by passing trucks or accidental bumping.
2. Sensitive to wide amplitude G's only. Preset at factory for the correct G-rating.
3. Positive sealing from -10 degrees F. to 150 degrees F.
4. Visual open-close indicator.
5. Manual reset.
6. Plumb line for mounting.
7. Tripping mechanism has non-creeping rolling latch.
8. Install valve per manufacturer's recommendations only.

D. Gate Valves:

NOTE: Gate valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this specification.

1. Bronze, 2 inches and smaller:

GV-1 Class 125, 200 psi CWP, bronze body and bonnet non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Hammond IB645, Crane 1701, Walworth Fig. 7, Milwaukee 105, American 3F, NIBCO T-113 or equal.

GV-1A Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

APPLICATION: Use on domestic hot and cold water systems.

GV-2 Same as GV-1, except solder ends:

NIBCO S 113, Milwaukee 115, Hammond IB 647 or equal.

GV-2A Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

APPLICATION: Use on domestic hot and cold water systems.
--

GV-3 Class 125, 200 psi WOG, rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Stockham B-100, Crane 428, NIBCO T-111, Milwaukee 148, Hammond IB-640 or equal.

E. Globe Valves: Bronze, 2 inches and smaller:

NOTE: Globe valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance of article 1.03 of this specification.
--

GLV-1 Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Hammond IB440, Milwaukee 502, Stockham B-13-T, NIBCO T-211-Y, Crane 5TF or equal.

GLV-1A Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Milwaukee UP 502, Hammond UP 440 or equal.

APPLICATION: Use on domestic hot and cold water systems.
--

LV-2 : Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, solder ends.

Hammond IB-418, Milwaukee 1502, NIBCO S-211-Y or equal.

F. Heater Vent Pipe:

1. Schedule Number:

HVP-1 Shall be UL approved for service specified. CBC (California Bldg. Code) Concealed heater vent pipe, including pipe in or through attic spaces, shall be approved double wall metal vent pipe. For recessed wall heaters, furnish B.W. type. All others may be Type B, or B.W. Clearances must comply with CBC code and conditions of UL listing.

American Metal Products Co., Inc., Dura-Vent Corp., Ameri-Vent,
Duravent, Hart and Cooley Mfg. Co., Metalbestos or equal.

G. Piping:

NOTE: All pipes in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance of article 1.03.C of this specification.

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.
 2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in Section 15075: Mechanical Identification.
 3. Refer to Heating and Air Conditioning Piping Systems: Section 15180 for heating and chilled water piping and fittings.
 4. Schedule Number: Description
- | | |
|-----|---|
| P-1 | Cast iron – Hubless, service weight, . ASTM A888, CISPI 301, conforming to CISPI 310 and installed in accordance to IAPMO IS 06. American Foundry, Tyler, or AB & I or equal. |
| P-2 | Galvanized steel, Schedule 40, ASTM A53., US Steel or equal. |
| P-3 | Copper drainage tube, underground, type L hard, ASTM B 88, Mueller, Cerro Brass or equal. |
| P-4 | Copper drainage tube, inside structure and above grade. Type DWV hard temper, ASTM B 306, Mueller, Anaconda, Cerro Brass, Cambridge-Lee, Halstead or equal. |
| P-6 | Copper water tube, Type L hard, ASTM B88. Mueller, Cambridge-Lee, Halstead or equal. (when used above ground only) |
| P-7 | Copper water tube, Type K hard, ASTM B88, by Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal. |

- P-9 Red seamless brass, 85-5-5-5, iron pipe size (IPS), threaded pipe, ASTM B43 Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal.
- P-10 Black steel pipe, Schedule 40, ASTM A53, Type E, ERW by US Steel, or equal.
- P-11 Seamless copper tubing, tempered drawn, Type M, ASTM B88 by Mueller, Cerro Brass or equal.

H. Pipe Fittings:

NOTE: All pipe fittings in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03.C of this specification.

- PF-1 Cast iron, soil or waste no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless-steel clamps. 2 bands for size 1 ½" thru 4", IAPMO, ASTM C 564 and CISPI 310.

American Foundry, Tyler, or equal.

- PF-2 Cast iron, soil or waste, Heavy-duty no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless-steel clamps. 4 bands for size 5" thru 10". IAPMO, ASTM C564 and CISPI 310.

American Foundry, Tyler, or equal.

- PF-3 Malleable iron, Class 150, threaded, galvanized, beaded, ANSI B 16.3. P-2 Stockham, Stanley Flagg, Grinnell Or equal.

- PF-4 Cast brass drainage fittings ASA B 16.23, ASTM B 42. Provide with copper drainage tube.

Mueller Brass, Nibco, Stanley Flagg, Lee Brass Or equal.

- PF-5 Wrought copper - solder type ANSI B 16.22

Mueller Brass, Nibco, Lee Brass or equal.

- PF-8 Bronze and brass, 250 psi, threaded, ASA B16.17 and F S WW-P-460

Mueller Brass, Lee Brass Or equal.

- PF-9 Malleable iron, Class 125, ANSI B 16.3, threaded or welded Schedule 40 black steel for 2 inches and below and welded for 2-1/2 inches and above, by Stockham or equal.

- PF-11 Cast-iron OD sized, bell and spigot gasket joints.

PF-12 Steel butt weld type, ASTM A 234WPB.

I. Pipe Isolators:

PLA-1 Absorption pad shall be not less than 1/2 inch thick, unloaded. Pad shall completely encompass pipe.

Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator or equal.

PLA-2 Plastic cushion to form an insulating liner and eliminate metal to metal contact when securing copper tubes and pipes in air conditioning and refrigeration insulation preventing galvanic erosion.

Hydra-Zorb Cushion Clamps, Acousto-Clamp or equal.

J. Pressure Gauge: Aluminum or steel case, minimum 4-1/4 inches dial; pressure type or combination vacuum-pressure type, with provisions for field calibration. Dial indicator to indicate pressure in psi with accuracy to within plus or minus 0.5 percent of maximum dial reading. Furnish gages with restriction screw, size 60, to eliminate vibration impulses. Black case and ring, bourdon tube of seamless copper alloy with brass tip and socket. Three-way gauge cock, constructed of brass with stuffing box, 1/2 inch couplings, with fixed or movable cap nut to shut off pressure gauge.

PG-1 Pressure type, black drawn steel case, 4-1/2 inches glass dial, range approximately twice line pressure.

Marsh Keckley TericeWeksler Weiss

K. Plug Valves:

PV-1 2 inches and smaller: Rockwell No.114, lubricated plug type, 200 lb., water operating gauge pressure iron body and plug, regular pattern, threaded, with indicating arc; by Walworth, Homestead, WKM, or equal.

PV-2. 2-1/2 inches and larger: Rockwell No.115 and No.165 lubricated plug type, 200 lb. water operating gauge. Iron body and plug, regular pattern, flanged, with indicating arc. Walworth, Homestead, WKM, or equal.

L. Safety, Relief Valves:

SRV-1 Combination temperature and pressure relief type. CSA approved. Set to open at 125 psi pressure.

Watts 40L Cash-Acme NCLX-1

SRV-2 Same as SRV-1, except provide on storage type water heater with anode in dip tube.

Watts 10 x L

Cash Acme NCLX-1

M. Strainers:

STR-1 Description: Wye type with monel or stainless-steel strainer cylinder (manufacturer's standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe valve) blowout piping, same size as blowout plug.

1. 2 inches and smaller:

C.M. Bailey No.100-A, 250 lb., cast iron body, threaded, Keckley 'B'.

STR-2 Y pattern cast iron bodies, 125 psi, monel screen. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2 inches, flanged ends fusion bonded epoxy coated for 2 1/2 inches and larger perforations, in accordance with the following:

1. Steam service - 40 sq. mesh.
2. Other services - 16 sq. mesh.

Bailey No.100 Armstrong RP&C Keckley

N. Thermometers Industrial:

T-1 Straight type with fixed or ratable stem, extruded or cast brass or cast aluminum case and brass separable well 6 inches minimum scale, angle or straight type range 30 degrees - 240 degrees F.

Weksler Terice Weiss

T-2 Round type 3-1/2 inches minimum dial range of 100 between 30 degrees and 155 degrees F., color coded red above 150 degrees F. Brass chrome plated case.

O. Thermometers (Remote):

T-3 Liquid-filled capillary type with bulbs as required for remote and insertion mounting dials of 3-1/2 inches minimum diameter, non-ferrous internal parts, external means for re-calibration, glass or plastic lens and steel or non-ferrous case suitable for wall, duct or panel mounting range 30 degrees - 240 degrees F.

- P. Pipe and Fitting Requirements Schedule: Unless otherwise specified or indicated on Drawings, pipe and fittings shall be installed in accordance with the following table:

TABLE I
PIPE AND FITTING SCHEDULE

Use	Limits	Pipe	Fittings
Domestic hot and Cold water, underground	Up To 8 inches	P-6	PF-5
Copper, underground only		P-7	PF-5
Cold water, underground (Site piping)	4 inches and over	P-14	PF-11
Domestic hot and cold water, in building and above ground	All	P-6	PF-5
In building above ground	2" to 8"	P-6	PF-5
Compressed air	Underground or in concrete	P-9	PF-8
	Above ground	P-10	PF-3
Drains from HVAC Equip.		P-6	PF-5
Downspouts, interior above and below grade, up to 5 feet from building.		P-1	PF-1 Or PF-2
Gas Natural	Underground	P-8	PF-6
Gas Natural	Above ground	P-10	PF-9
Copper Drainage Tube (Underground)	Waste and Vent	P-3	PF-4
Copper Drainage	Waste and Vent	P-4	PF-4

Tube (Above Ground)			
Vents	New Building	P-1	PF-1 or PF-2 (IRE) if required by engineer
Vents	Existing Buildings and Exposed Downspouts	P-2	PF-3
Waste lines, Sanitary		P-1	PF-1 or PF-2 (IRE) if required by engineer

Q. Unions:

1. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished):
 - a. At each threaded or soldered connection to equipment and tanks, except in Freon or fuel gas, piping systems, whether indicated or not.
 - b. At downstream, threaded connection to each manually operated threaded valve and cock, and each threaded check valve, except those in Freon piping systems, and except those in yard boxes or access boxes, whether indicated or not.
 - c. At each threaded connection to threaded automatic valves (except those in freon piping systems) such as reducing valves and temperature control valves, whether indicated or not.
 - d. If grooved piping is used, couplings shall serve as unions. Additional unions are not required
2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.
- B. Pipe Installation:
 - 1. Install piping parallel to wall and provide an orderly grouping of proper workmanship.
 - 2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.
 - 3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the Architect.
 - 4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.
 - 5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.
 - 6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Kees Protecta-Plate, or equal.
 - 7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the Architect, or indicated on Drawings.
 - 8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping.
 - 9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.
 - 10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of

pipe being installed and except where their installation is specifically reviewed by the Architect.

11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 15010: Basic Mechanical Requirements.
12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top of sewer line.
13. Hot and chilled water circulating piping installed for space heating or cooling shall pitch up to a high point at a slope of 1/4 inch in 10 feet in the direction of flow. Where supply and return lines are exposed, both lines shall pitch in same direction. Otherwise, where possible, lines shall pitch up toward compression tank.
14. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide and install pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide and install adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors

(For fire rated wall penetrations follow the California Building Code)
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2. Sleeves shall provide 1/2 inch clearance around pipes, except plastic pipe shall have 1-inch clearance. Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.
3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings

may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.

4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between 2 or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.
5. Where pipes pass through waterproofed walls, floors, or floors on grade, caulk with Link-Seal Modular Seals or equal between pipe and sleeve to provide a waterproof joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of caulked sleeves if reviewed by the Architect.
6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of caulked or compression joint to allow for expansion.
7. Provide and install polished, chrome-plated flanges when plumbing pipes pass through walls at plumbing fixtures, etc., as specified in Section 15400: Plumbing. Provide and install polished steel, chromium-plated split floor and ceiling plates at locations where pipes pass through walls, floors, ceilings, and partitions in finished portion, which neatly conceals pipe insert.
8. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.

NOTE: Certificate described above is not valid unless it has been issued while welder was working for his current employer, and unless welder has performed type of work described by certificate in the preceding 3 months. Requirements for possession of a valid certificate shall not be waived for welders fabricating unfired pressure vessels when the Specifications require compliance with ASME code or when welding pipe carries working pressures greater than 75 psi and temperatures greater than 250 degrees F.

D. Pipe Joints and Connections:

1. Pipe and tubing shall be cut per IAPMO 1.S. Pipe shall have rough edges or burrs removed so that a smooth and unobstructed flow shall be provided.
2. Hot tapping of gas lines is strictly prohibited.

3. Threaded Pipe: Joints in piping shall be installed according to the following service schedule:
 - a. Refrigerant and Soap Piping: Litharage and glycerine, or Expando, or equal.
 - b. Plastic Piping: Teflon pipe joint compound tape.
 - c. Oxygen Piping: Wash treads with S.P., rinse, blow-dry and apply litharge and glycerine.
 - d. Cleanout Plugs: No compound shall be used. After inspection and test, plugs shall be removed, cleaned, greased, and replaced.
 - e. All other services Furnish sealant, suitable and as reviewed by the Architect.
 4. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ASA B 2.1 for tapered pipe threads.
 5. Joint compounds shall be smoothly placed on male thread and not in fittings. Threaded joints shall be installed tight with tongs or wrenches and caulking of any kind is not permitted. Failed joints shall be replaced with new materials. Installation of thread cement or caulking to repair a leaking joint is not permitted.
 6. Sharp-toothed Stilson, or similar wrenches, is not permitted for the installation of brass pipe or other piping with similar finished surfaces.
- E. Copper Tubing and Brass Pipe with Threadless Fittings:
1. Silver brazed joints shall be used for attaching fittings to non-ferrous metallic refrigerant piping.
 2. Non-pressure gravity fed condensate lines may be soldered with 95/5 solder
 3. Silver brazing alloy, Class BCUP-5. Surfaces to be joined shall be free of oil, grease, and oxides. Socket of fitting and end of pipe shall be thoroughly cleaned with emery cloth and wiped to remove oxides. After cleaning and before assembly or heating, flux shall be installed to each joint surface and spread evenly. Heat shall be applied in accordance with instructions in the Copper Tube Handbook issued by Copper Development Associates. Joints constructed of rough bronze fittings shall be provided as recommended by manufacturer.

4. Do not overheat piping and fittings when installing silver brazing.
 5. Joints in non-ferrous piping for services not covered above, shall be installed with solder composed of 95-5 tin-antimony, ASTM B32, Grade 5A. Surfaces to be jointed shall be free of oil, grease, and oxides. Sockets of fitting and end of pipe shall be thoroughly cleaned with emery cloth to remove oxides. Solder flux shall be sparingly installed, and solder added until joint is completely filled. Do not overheat. Excess solder, while plastic, shall be removed with a small brush in order to provide an uninterrupted fillet completely around joint. Random inspection of joints shall be conducted by PI to ensure joints are lead-free.
 6. Grooved end joints for copper piping shall be assembled in accordance with the latest Victaulic recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic.
- F. Ring-Type Pipe: Joints shall be installed in accordance with manufacturer's instructions with grooved couplings, fittings and rubber rings. Couplings and pipe shall be compatible and of the same manufacturer. Rings shall be accurately located and installed by grooves in coupling. Pipe shall be installed with zero deflection unless otherwise specified. Pressure pipe shall be furnished with thrust blocks at each offset point.
- G. Grooved End Pipe Joints: Grooved end joints for carbon steel piping shall be assembled in accordance with the latest Victaulic recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic.
- H. Valves: Valves shall conform to the following:
1. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.
 2. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.
 3. Globe valves of disc type shall be furnished with composition disc suitable for service on which installed.
 4. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.

5. Provide chain operators on valves 2 inches and larger located 7 feet or more above the servicing floor level.
6. Valves for similar service shall be of one manufacturer.
7. Except where otherwise specified, valves shall be Victaulic, Stockham, Crane, Jenkins, Milwaukee, Hammond or American, Nibco, Hoffman
8. Ball valves below grade in yard boxes shall have stainless steel handles.
9. Furnished hose bibs in dense garden areas shall be 3/4 inch in size with 1 hose bib in the lunch pavilion 1 inch in size. Other furnished hose bibs, unless otherwise noted or specified, shall be 3/4 inch lock shield type. Bibs shall be furnished with vacuum breaker protection.
10. Safety valves and pressure relief valves shall have stamp of approval as required by ASME and shall be provided with annual test lever. Where a hot water storage tank is heated by means of a coil, pressure relief valve shall have a steam BTU discharge rating of the coil. Discharge pipe from safety or pressure relief valves shall be not less than one pipe size larger than inlet pipe size of valve. Discharge pipe shall terminate as indicated and shall be free of traps. In addition to locations specified, pressure relief valves shall be installed in the following locations:
 - a. On discharge side of each pressure-reducing valve.
 - b. On each water heater connected to a hot water storage tank and other pressure vessels.
 - c. On cold water line to each water heater or hot water storage tank when there is a check valve, backflow prevention valve or similar device between water heater or hot water storage tank and meter or relief valve at the pressure reducing valve assembly.
 - d. On discharge side of each air compressor.
 - e. On each air receiver connected to an air compressor.
11. Temperature relief valves and combination temperature and pressure relief valves shall be as specified and furnished as set forth in this section. Discharge pipe from relief valves shall be not less than discharge area of valve or valves it connects, based on discharge area of valves, and shall terminate as indicated and free of any traps. Valves shall be installed at following locations:

- a. A combination temperature and pressure relief valve or combination of valves on each hot water storage tank. Temperature sensing element shall extend into water inside tank.
 - b. A combination pressure and temperature relief valve on each water heater not connected to a storage tank. Temperature sensing element shall extend into water inside heater tank. This valve shall be required in addition to any relief valve installed on cold water line.
- 12. Manual air vent valve assemblies shall be installed at each high point of hot water space heating and chilled water piping systems. Valves shall discharge through 1/4-inch diameter copper tubing and drain to nearest floor sink. Automatic type air vent valve shall only be installed where specifically indicated. Radiator, convectors, and finned pipe convectors shall be fitted with packless radiator valves, angle or straight pattern. Each convector or radiator installed as part of a space hot water heating system shall be furnished with a manual-type air vent valve.
- I. Strainers: Strainers shall be installed on each water main downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange or groove type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, or equal.
- J. Hangers and Supports:
 - 1. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.

2. Hose faucets, compressed air outlets, and similar items at ends of pipe branches shall be rigidly fastened to building construction near point of connection.
3. Piping shall not be supported by wire, rope, wood, plumbers' tape, or other non-recognized devices.
4. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of 5, based on ultimate tensile strength of material installed.
5. Burning or welding of any structural member under load is not permitted. Field welding not specified on Drawings or reviewed Shop Drawings is not permitted without review by Architect and DSA.
6. Burning holes in beam flanges or other structural members is not permitted without review by the Architect and DSA.
7. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between covering and hanger. Installing hangers directly on pipe and butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.
8. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Tolco, Carpenter and Patterson, or Fee and Mason, as follows:
 - a. Tolco I beam, Fig.62 for maximum 1000 lbs.
 - b. Tolco I or WF beam, Fig. 329, for maximum of 1290 lbs.
9. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Tolco, Carpenter and Patterson, or Fee and Mason, as follows:
 - a. Tolco Fig.310 for maximum of 600 lbs.
 - b. Tolco Fig. 309 for maximum of 1140 lbs.
10. For fastening to wood ceilings, beams, or joists, furnish Grinnell figure 128 or 202 pipe hanger flange fastened with drive screws. Under wood floors, 3/8-inch hanger rods shall be hung from 2 inch x

2 inch x 1/4 inch angle clips 3 inches long, with 2 staggered 10d nails, clinched over joist.

11. Hanger rod sizes for copper, iron, or steel pipe: 3/8 inch for pipe sizes 1/2 inch through 2 inches, 1/2 inch for pipe sizes 3 inches, 4 inches and 5 inches, 5/8 inch for pipe size 6 inches, and 3/4 inch for 8 inches and 10 inches pipe.
12. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.
13. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.
14. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8-inch-thick rubber, neoprene, or soft resilient cloth.
15. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.
16. Vertical Piping:
 - a. Vertical pipe risers shall be securely supported with riser clamps of recognized type. Risers in reinforced concrete buildings shall be furnished with extension clamps fastened to pipe above each concrete floor slab with extended arms of clamp to rest on slab. Clamps shall be provided with lead or Teflon liners when installed on copper tubing. Clamps shall be plastic-coated when installed on non-ferrous pipe or tubing.
 - b. Copper tubing in sizes 1-1/2 inches and larger and steel pipelines passing up through building shall be supported at each floor of building or every 15 feet whichever is less.
 - c. Copper tubing sizes 1-1/4 inches and smaller shall be supported at not intervals not more than 6 feet on center. Special provisions shall be installed for vertical lines subject to expansion and contraction caused by operating temperature differences.
 - d. Vertical cast iron pipelines shall be supported from each floor and at its base. Malleable iron or steel pipe clamps with minimum thickness of 1/4 inch shall be furnished and fastened around pipe for support.

17. Horizontal Piping:

- a. Pressure piping on roofs shall be supported from stands, trapezes, or structures so that the bottoms of pipes clear the roof surface by 10 inches.
- b. Insulated steam, space heating hot water, insulated condensate lines, insulated domestic hot water supply and return piping shall be supported with Tolco figure 4 steel hangers with welded eye rods to permit hinge movement at point of attachment of hangers. Hinge movement at point of support shall be provided by welded eye linked rods Tolco figure 101L.
- c. Domestic cold water piping, chilled water supply and return piping, condenser water piping, insulated refrigerant piping, gas piping, compressed air piping, cast iron soil piping, galvanized steel vents, waste and downspout piping and glass may be supported with Tolco figure 1 or equal hangers with rods, turnbuckles and inserts suitable for above hangers.
- d. Maximum hanger and support spacing shall conform to CPC schedule for horizontal piping installed above grade.

18. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.

19. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

20. In systems where grooved piping is used, couplings shall be provided with angle pattern bolt pads to comply with support and hanging requirements of ANSI B31.1, B31.9 and NFPA-13.

K. Flashings:

1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.
2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through a roof shall be 4-pound soft sheet lead. Flashing and flanges for ducts and heater vents passing through exterior walls shall be 22 gage sheet metal. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct. No soldered joints on roof flashings will be allowed.

3. Lead flashing and flanges shall be constructed of 4-pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out onto roof a minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 7 inches.
 4. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2-1/2 inches. Flanges on gas-fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per National Fire Code, Pamphlet 211-1105.
 5. Cast iron, steel, brass, and copper pipe, which terminates less than 18 inches above roof, shall be furnished with a combination counterflashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter-flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.
 6. Counterflashing and combination counter-flashing sleeves and vandal-proof hoods shall be cast iron, vandal-proof, threaded, caulked or approved gas-heated sleeve type. Counter-flashing sleeves on each of these items shall extend down over flashing a minimum of 3/4 inch.
 7. Flashing and flanges on ducts shall be installed waterproof at point of connection to the duct by riveting and soldering. Storm collars shall be securely screwed and installed waterproof around appliance vent pipe immediately above flashing.
 8. Vent piping above roof shall be furnished with a combination counter-flashing sleeve and vandal-proof hood.
- L. Equipment Installation: Install roof or floor mounted equipment on level platforms, housekeeping pads or curbs and provide sound, vibration and seismic control measures per Section 15070, unless indicated otherwise whether indicated on drawings or not

END OF SECTION 23 05 13

Part 1 GENERAL

1.01 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.
- B. See Division 15 Section "Mechanical Sound Vibration Control" for vibration isolation supports and hangers and seismic restraints.

1.02 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.03 SUBMITTALS

- A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.
- C. Welding certificates.

1.04 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and seismic restraint by a qualified professional engineer.

Part 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - (1) Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

- (2) Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components.

- (1) All products used must have an ICC or other recognized report, as included by DSA form IR A-5. Excerpt below.
 - a **ACCEPTANCE OF STRUCTURAL PRODUCTS:** Structural products and materials, as described in the Scope section of this IR, may be accepted for use on DSA projects if they meet the following requirements:
 - 1)** Products, including alternate materials, must have a valid evaluation listing/report issued by a recognized evaluation agency (see Section 3 below).
 - 2)** In addition to valid listings, products that are prescribed in CBC and its adopted standards, including DSA IRs or Bulletins, shall comply with those prescribed requirements.
- (2) Manufacturers:
 - a AAA Technology and Specialties Co., Inc.
 - b B-Line Systems, Inc.
 - c Carpenter & Patterson, Inc.
 - d Empire Tool & Manufacturing Co., Inc.
 - e Globe Pipe Hanger Products, Inc.
 - f Grinnell Corp.
 - g GS Metals Corp.
 - h Michigan Hanger Co., Inc.
 - i National Pipe Hanger Corp.
 - j PHD Manufacturing, Inc.
 - k PHS Industries, Inc.
 - l Piping Technology & Products, Inc.

- (3) Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
 - (4) Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
- (1) Manufacturers:
 - a B-Line Systems, Inc.
 - b Grinnell Corp.
 - c GS Metals Corp.
 - d Michigan Hanger Co., Inc.
 - e National Pipe Hanger Corp.
 - f Thomas & Betts Corp.
 - g Unistrut Corp.
 - h Wesanco, Inc.
 - (2) Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
 - (3) Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.
- (1) Manufacturers:
 - a Carpenter & Patterson, Inc.
 - b Michigan Hanger Co., Inc.
 - c PHS Industries, Inc.
 - d Pipe Shields, Inc.
 - e Rilco Manufacturing Co., Inc.
 - f Value Engineered Products, Inc.

- (2) Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
- (3) Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
- (4) For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
- (5) For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
- (6) Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.03 MISCELLANEOUS MATERIALS

- A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used, such as on mechanical detail 1/M3.2.
- B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- C. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
 - (1) Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
 - (2) Properties: Non-staining, non-corrosive, and nongaseous.
 - (3) Design Mix: 5000-psi, 28-day compressive strength.

Part 3 EXECUTION

3.01 APPLICATIONS

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

- (1) Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30. Refer to detail 1/M3.1 and structural calculations.
- D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - (1) Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - (1) Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - (1) Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 - (2) Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - (3) Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - (4) C-Clamps (MSS Type 23): For structural shapes.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - (1) Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

3.02 INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes. Support pipes of various sizes together and space trapezes for smallest pipe size

or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
- F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- K. Insulated Piping: Comply with the following:
 - (1) Attach clamps and spacers to piping.
 - a Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c Do not exceed pipe stress limits according to ASME B31.9.

- (2) Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
- (3) Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
- (4) Shield Dimensions for Pipe: Not less than the following:
 - a NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b NPS 4: 12 inches long and 0.06 inch thick.
 - c NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
- (5) Pipes NPS 8 and Larger: Include wood inserts.
- (6) Insert Material: Length at least as long as protective shield.
- (7) Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.03 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Place grout under supports for equipment and make smooth bearing surface.

3.04 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - (1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - (2) Obtain fusion without undercut or overlap.
 - (3) Remove welding flux immediately.

- (4) Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.06 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils. See Division 9 Section 09900 Painting for paint materials and application requirements.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 05 29

MECHANICAL SOUND, VIBRATION AND SEISMIC CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Reduction or elimination of excessive noise or vibration within building due to operation of equipment, machinery, piping, and ductwork as specified.
 - 1. Vibration isolators.
 - 2. Seismic restraint devices.
 - 3. Lining and enclosing ductwork.
 - 4. Flexible ducts, conduits and piping.

1.02 GENERAL REQUIREMENTS

- A. Provide vibration isolators to eliminate or reduce the transmission of vibration noise to any part of building and mitigate vibration frequency and load imposed by equipment. Vibration isolators, base frames, inertia bases and seismic restraints shall be of sufficient size, flexibility and load distribution configuration to assure that deflection, stability and seismic restraint requirements are met without permitting excessive movement when starting. For typical units, no fewer than four isolators shall be provided. Isolators shall be provided to deflect uniformly under operating gravity and equipment thrust loadings to within $\pm 10\%$ of specified deflection values.
- B. Static deflections specified are based on the anticipated equipment characteristics. In the event the equipment proposed by the Contractor has characteristics other than those indicated, particularly the rated rpm, the static deflection shall be re-evaluated, and the proper mountings and other devices shall be provided.
- C. Where fabricated vibration isolator units are indicated, furnish manufacturer's standard catalog products with printed loading ratings or certified submittals
- D. Seismic Requirements:

1. Refer to Guidelines for Seismic Restraints of Mechanical Systems as shown on the structural drawings, for minimum seismic restraints required on mechanical components design and construction details.
2. Provide seismic restraints for mechanical equipment or components specified. Where equipment is specified with proprietary names, design for seismic restraints is for first proprietary name listed.
3. Provide restraints, bracing and anchorage as required for the mechanical equipment, electrical equipment and components specified in the Contract Documents. Restraints, bracing and anchorage shall be installed to resist the total design earthquake or wind loads in any direction in accordance with CBC Code and SMACNA guidelines.
4. Provide restraints, bracing, and anchorage for the mechanical equipment and components.
5. For rigidly mounted liquid filled steel pipe, comply with the following:
 - a. Provisions of NFPA Pamphlet 13, Section 3 for sway bracing.
 - b. Provisions of NFPA Pamphlet 13, Section 3 for earthquake protection.
 - c. Hanger spacing as specified in Section 15050 under Hanger Spacing Schedule.
 - d. SMACNA Guidelines for Seismic Restraints, of Mechanical Systems and Plumbing Piping and approved by DSA.
6. For flexibly mounted liquid filled steel pipe, comply with the following:
 - a. Provisions of the California Building Code for flexibly mounted equipment.
 - b. Provisions of VISCMA (Vibration Isolation and Seismic Control Manufacturer's Association) Seismic Control Device Installation, Best Practices Manuals.
 - c. Installer may provide a DSA or OSHPD approved system such as the SMACNA Guidelines with Addendum No. 1, the Mason Industries Seismic Restraint Guidelines or other proprietary pre-approved system.

7. For ductwork and other mechanical equipment restraints, comply with SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems and approved by DSA.

1.04 SUBMITTALS

A. Provide in accordance with Division 01.

1. Catalog cuts and data sheets on specific vibration isolators, seismic restraints, and anchors demonstrating compliance with the Specifications.
2. Shop Drawings for each piece of equipment including dimensions, structural member size, support point, vibration, and seismic restraints.
3. Written approval of frame design to be furnished by the equipment manufacturer.
4. Drawings indicating methods for suspension, support, seismic restraints, guides, etc., for piping, ductwork, etc.
5. Drawings indicating methods for isolation of pipes, ducts etc., piercing slabs, beams, etc.

B. Vibration Test Reports: At completion of installation, submit the following documents. Submission of these documents must be complete before final acceptance of vibration isolation systems is given. Assistance from the vibration isolation equipment Manufacturer may be required.

1. Complete tabulation showing for each vibration isolator:
 - a. Actual static deflection measured at the project.
 - b. Specified minimum static deflection.
2. Report certifying:
 - a. Each piece of operative rotating mechanical equipment does not exceed the specified vibration displacement level.
 - b. Each piece of isolated equipment or equipment component (ducts, pipes, conduit, etc.) is not short-circuited by any means.
 - c. Requirements of section 2.00 are satisfied for all equipment.

1.05 QUALITY ASSURANCE

- A. Standards and Codes: Comply with applicable codes and standards having jurisdiction including, but not limited to:
 - 1. NFPA, Pamphlet 13.
 - 2. ASHRAE Systems Handbook.
 - 3. SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems.
 - 4. CBC.
 - 5. VISCMA Seismic Control Device Installation, Best Practices Manuals.
- B. Qualifications of Manufacturer and Installers: Comply with provisions as set forth in Section 15010: Basic Mechanical Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Furnish and install vibration dampers, sound isolation pads, flexible connections and similar equipment required to prevent sound of water flowing in pipes, vibration of motors, and motor operated equipment from being transmitted to building structure; and, in case of fans, from being transmitted along ducts. Hot, tempered, and cold water lines shall be isolated from hangers, clamps and structural members by furnishing a commercially manufactured assembly of a hair felt or neoprene pad, cemented in a galvanized iron sleeve. Piping shall be isolated from vibrating equipment by furnishing required flexible connectors.
- B. Excepting sump pumps and in-line circulating pumps, pumps and similar motor operated equipment shall be installed on anti-vibration units.
- C. Fans, except curb-mounted roof-type exhaust fans and wall mounted propeller fans, shall be installed with anti-vibration units, whether indicated on Drawings or not. Fans built into air handling units may be furnished with independent anti-vibration mountings or whole unit may be installed on an external vibration isolation system.
- D. Other equipment shall be installed on anti-vibration bases, pads, or hangers, unless specifically noted otherwise on Drawings. Package units, furnished with built in anti- vibration bases, do not require unit bases unless otherwise specified.

1. Unless specified otherwise, anti-vibration bases shall be Mason, M.W. Sausse/Vibrex, of the Model Number specified or indicated on the drawings or equal by Mason or Korfund. Furnished base including sub-base, shall be manufactured by same company with fan and integral motor base. Seismic restraints may be incorporated into bases or furnished separately.
2. Inertia anti-vibration bases shall conform to requirements indicated.
3. Unless noted otherwise, furnished anti-vibration bases, including supporting units for inertia bases, shall be of the spring type.
4. Selection of bases or supporting units shall be in accordance with manufacturer's recommendations based on following installed minimum effective isolation efficiencies (where not provided with each piece of equipment):

a. Centrifugal fans, packaged fan and coil units and cooling towers, less than 800 RPM	80 percent
b. Centrifugal fans over 800 RPM	90 percent
c. Centrifugal pumps	95 percent
d. Reciprocating compressors	95 percent
- E. Flexible duct connections shall be provided at inlet and outlets of each fan or HVAC unit, except curb-mounted roof exhaust fans whether indicated on the drawings or not.
- F. Flexible pipe or conduit connections shall be provided at piping and conduit connections to HVAC units, pumps, compressors and other moving (reciprocating or rotating) mechanical or electrical equipment provided under this section whether indicated on the drawings or not.
- G. Flexible connections for freon piping shall be seamless flexible metal hoses of type and length recommended by manufacturer and suitable for system operating pressure.
- H. Flexible connections for all other piping shall be flexible metal hose or spool type with flanged ends, unless otherwise specified. Metal hose shall be covered with protective braiding in areas where physical abrasion may occur, or for personnel safety.
- I. Spool types shall be similar to American Rubber Co., Mercer Rubber Co PROCO, and hose types shall be similar to D.M.E., Inc., U.S. Flex, Pennflex, Anaconda Flexpipe or Keflex with any required modifications to meet

specified requirements. Flanges shall be furnished with steel retaining rings. Units installed on discharge side of pumps shall be furnished for a suitable working pressure of not less than 100 psig, and those on suction side for working pressures of 50 psig or 30 inches Hg vacuum.

- J. Units installed in cold water lines (less than 125 degrees F.) shall furnish a minimum temperature rating of 180 degrees F. and those installed in hot water lines (above 125 degrees F.) shall be constructed of special heat resistant materials and be furnished for a minimum temperature rating of 220 degrees F., continuous operation. Units shall be able to withstand a maximum lateral deflection of 3/8 inch. Temperature and pressure ratings shall be molded into body of each spool unit, so they are easily identified. Spool types shall be for straight in flow only.
- K. Spool type units shall be furnished with control units comprised of a minimum of 2 tie-rods and anchor plates or internal guide sleeves to prevent excessive elongation or misalignment. Rubber washers shall be provided under bolt heads and rubber grommets in bolt holes to prevent any metal to metal contact between bolts and flanges.
- L. Where hose type units are furnished, restraining anchors or braces shall be provided if excessive or undesirable pipe movement occurs when system is operated.

2.02 GENERAL PROPERTIES OF VIBRATION ISOLATORS.

- A. Shall be provided with markings so that, after adjustment, when carrying their load, deflection under load can be verified; thus determining that load is within proper range of device and that correct degree of vibration isolation is being provided according to the design.
- B. Isolators to operate in direct proportion to their load versus deflection curve. Load versus deflection curves shall be furnished by manufacturer and must be linear over a deflection range of 50 percent above design deflection.
- C. Wave motion through isolator shall be reduced to following extent: Isolation above resonant frequency shall follow theoretical prediction based upon an un-dampened single degree of freedom system with a minimum isolation of 50 decibels above 150 cycles per second.
- D. Vibration isolator spring diameters shall be no less than their deflected height. Furnish spring with a 50 percent overload safety factor.
- E. Unless otherwise indicated, equipment installed on vibration bases shall provide a minimum operating clearance of one inch between structural

steel base and floor or support base. Provide flexible connectors in piping and flexible conduit in power wiring to minimize transmission of vibration.

- F. Isolators and springs exposed to weather shall be hot-dipped galvanized or powder coated after fabrication and before installation. Hot-dipped zinc coating shall be not less than 2 ounces per square foot by weight complying with ASTM A123. In addition, provide limit stops to resist wind velocity.
- G. Where indicated, provide structural steel bases with height saving brackets, and minimum of 3 points of support. Isolators shall be furnished with a method for leveling.
- H. Design isolators and seismic restraints for positive anchorage against uplift and overturning.
- I. Provide and install, under this section of the Specifications, structural steel required to properly support equipment and steel required to support horizontal thrust arrestors.

2.03 ISOLATOR TYPES

- A. Type A: Steel Spring Isolators: Un-housed steel spring isolators, laterally stable and unrestrained. Design springs so that ratio of horizontal to vertical spring (stiffness) constant is between 0.9 and 1.3. Natural frequency of isolator must be 1/3 to 1/4 of driving frequency that is to be controlled. Isolators to provide a minimum additional travel to solid equal to 50% of rated deflection. Isolators shall be furnished with built-in leveling bolts complete with sound isolation pads type B. Static deflection as specified.

2.04 B. EQUIPMENT FRAMES

- A. Type B Frame: Channel members, rigidized structural steel frame with brackets. Frame to be constructed of channel steel with section depth equal to 1/10th length of longest structural member. Frame shall be M.W. Sausse type RMSB-C or equal by Mason Industries.
- B. Type C Frame: Steel gusset or bracket welded or bolted directly to machine frame in order to accommodate isolator. Frame shall be M.W. Sausse type RMSG or equal by Mason Industries.

2.05 MATERIALS AND CONSTRUCTION

- A. Duct Liner: As indicated in Section 15080: Mechanical Insulation.
- B. Flexible Ducts: As indicated in Section 15080: Mechanical Insulation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide isolators, flexible pipe connectors, flexible electrical conduit and flexible duct connectors at all moving mechanical system components to prevent transmission of vibration noise to any part of building whether indicated on the drawings or not.
- B. Install isolators to suit imposed load and the vibration frequency to be absorbed. Isolator units shall furnish adequate strength and flexibility to exhibit proper resiliency under machine load and impact without permitting excessive movement when starting.
- C. Where commercial vibration isolator and seismic restraint units are specified, furnish manufacturer's standard catalog products with printed loading ratings, or provide substantiating calculations.
- D. Install vibration isolators and seismic restraints in accordance with manufacturer's printed installation instructions.
- E. Where equipment is belt driven and motor is not installed on equipment, install motor, and driven equipment on unitized support, and install entire support isolators. Unitized support to be provided with adjustable slide rails sized for motor weight and frequency. Support shall be Mason Industries type WF, M.W. Sausse type RMSF, or equal.
- F. Do not install any equipment, piping, conduit, ductwork, etc., that makes rigid contact with building or its structural members, unless reviewed by the Architect.
 - 1. Coordinate Work with other trades to avoid rigid contact with building.
 - 2. Correct, before installation, any conflict with other Work that would result in solid contact to equipment or piping due to inadequate space.
 - 3. Obtain inspection from the PI for concealed Work before enclosure.
 - 4. Notify manufacturer before installation of vibration isolation devices so that manufacturer may instruct and demonstrate technique for proper installation.
- G. The furnishing or installation of vibration isolators must not cause any change of position or alignment of equipment, ductwork, or piping, resulting in stresses in piping or ductwork, connections, or misalignment of

shafts or bearings. Equipment, piping, and ductwork shall be maintained in a rigid position during installation. Load shall not be transferred to isolator until installation is complete and under full operational load.

- H. Air Compressors, Water Chillers, Pumps, Vacuum Pumps, Boilers with Integral Combustion Fans and Miscellaneous Equipment, mounted on roof or raised floors: Install each unit with its motor on a vibration isolated base utilizing type B frames except where a type D frame is indicated on Drawings. Install steel support frame furnished by equipment manufacturer, utilizing equipment anchor bolt templates and isolator height saving brackets. Provide springs as specified for type "A" isolator; static deflection shall be minimum of 2 inches.
- I. Fans (2000 rpm or higher) Air Compressors, Vacuum Pumps, Miscellaneous Equipment, mounted on grade: As specified for grade mounted boilers except furnish type C isolators.

NOTE TO ARCHITECT: PROVIDE HOUSEKEEPING PAD DETAILS ON DRAWINGS

- J. Boilers mounted on grade: Install each unit on concrete housekeeping pad with sound isolation pad designed for applicable equipment loading. Unit shall be fastened to housekeeping pad to prevent any movement.
- K. Air Handling, Air Conditioning Units, Floor Mounted Fans, and Cabinet-Installed Fans: Install entire casing including filters, mixing box, fan section, coil sections, etc., on a continuous, integral, structural steel base, as indicated. Furnish type A, B, or C frames, reinforced as necessary to prevent distortion of frame. Furnish isolator type A; static deflection shall be a minimum of 1-1/2 inches
- L. Suspended Fans and Air Conditioning Unit Fan Coils and Unit Ventilators: Suspend each integral unit from overhead structure on steel spring and elastomer hanger isolators. Support deflection under rated load of 3/8 inch. Provide spring static deflection as follows:

Fan RPM	Min. Deflection
200 – 400	3 inches
400 – 700	2 inches
Above 700	1 inch

- M. Pipe Isolation: Where indicated and as required, furnish and support each pipe from an isolator. Isolator for the first 5 support locations away from vibrating equipment shall have the same deflection as the equipment

isolators. After that, isolators shall be a neoprene-in-shear type of size as recommended by manufacturer; except where indicated on Drawings, pipe hanger rod shall be furnished with a steel spring isolator and elastomeric element, with lower rod capable of 30 degrees total misalignment without contact on spring housing.

- N. Seismic Restraints: Floor or pad mounted equipment that do not require vibration isolators, shall be bolted to floor or other support. Floor mounted equipment with vibration isolators shall be provided with lateral and vertical restraining devices on all sides of base to restrict displacement of equipment. On all sides of suspended equipment, provide bracing for rigid supports and provide aircraft cable restraints for resiliently supported equipment.
- O. Ductwork, duct acoustical lining, manual volume dampers and flexible ducts: Do not reduce length of duct runs, duct acoustical lining, manual volume dampers and flexible ducts for economy.
- P. Installation of flexible ducts at air inlets and outlets: Do not attach flexible ducts directly to air inlets and outlets unless a straight, smooth and uniform air flow can be achieved with sufficient space to make an elbow with a radius of at least three times the diameter of the duct. If sufficient space is not available to make such an elbow, provide a rigid elbow or a lined plenum.
- Q. Placement of Air Devices: Do not relocate air devices without the Architect's approval.

3.02 EXAMINATION

- A. Arrange for the services of a certified representative of isolation manufacturer to visit the Project site for inspecting installation of devices. In the event the isolators do not meet specified requirements perform necessary revisions. Submit a written report to the Architect signed by above representative indicating all devices are properly installed and are operating as specified or required by isolation manufacturer.

END OF SECTION 23 05 48

Part 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment nameplates.
 - 2. Equipment markers.
 - 3. Equipment signs.
 - 4. Access panel and door markers.
 - 5. Pipe markers.
 - 6. Duct markers.
 - 7. Valve tags.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.03 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

Part 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
 - 1. Data:
 - a Manufacturer, product name, model number, and serial number.
 - b Capacity, operating and power characteristics, and essential data.
 - c Labels of tested compliances.
 - 2. Location: Accessible and visible.
 - 3. Fasteners: As required to mount on equipment.

- B. Equipment Markers: Engraved, color-coded laminated plastic. Provide holes for mechanical fasteners.

1. Terminology: Match schedules as closely as possible.

2. Data:

- a Name and plan number.
- b Equipment service.
- c Design capacity.
- d Other design parameters such as pressure drop, entering and leaving conditions, and speed.

3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

- C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Data: Instructions for operation of equipment and for safety procedures.

2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.

3. Thickness: 1/16 inch, unless otherwise indicated.

4. Fasteners: Self-tapping, stainless-steel screws.

- D. Access Panel and Door Markers: 1/16-inch- thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch hole, in each corner for attachment.

1. Fasteners: Self-tapping, stainless-steel screws.

2.02 PIPING IDENTIFICATION DEVICES

- A. Do not use pipe markers or plastic tapes for bare pipes conveying fluids at temperatures of 125 deg F (52 deg C) or higher.

- B. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.

2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- C. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

2.03 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme. Provide 5/32-inch hole for fastener.
1. Material: 0.032-inch- thick brass.
 2. Valve-Tag Fasteners: Brass beaded chain.

Part 3 EXECUTION

3.01 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.02 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten nameplates on each major item of mechanical equipment that does not have a nameplate or has a nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
1. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
 2. Pumps, compressors, chillers, condensers, and similar motor-driven units.

3. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
 4. Fans, blowers, primary balancing dampers, and mixing boxes.
 5. Packaged HVAC central-station and zone-type units.
- B. Install equipment markers with self-tapping stainless steel screws on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
 - a Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b Meters, gages, thermometers, and similar units.
 - c Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
 - d Pumps, compressors, chillers, condensers, and similar motor-driven units.
 - e Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
 - f Fans, blowers, primary balancing dampers, and mixing boxes.
 - g Packaged HVAC central-station and zone-type units.
 - h Tanks and pressure vessels.
 - i Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

- C. Install equipment signs with self-tapping stainless steel screws on or near each major item of mechanical equipment. Locate signs where accessible and visible.
1. Identify mechanical equipment with equipment markers in the following color codes:
 - a Green: For cooling equipment and components.
 - b Yellow: For heating equipment and components.
 - c Orange: For combination cooling and heating equipment and components.
 2. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 4. Include signs for the following general categories of equipment:
 - d Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - e Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
 - f Pumps, compressors, chillers, condensers, and similar motor-driven units.
 - g Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
 - h Fans, blowers, primary balancing dampers, and mixing boxes.
 - i Packaged HVAC central-station and zone-type units.
 - j Tanks and pressure vessels.
 - k Strainers, filters, humidifiers, water-treatment systems, and similar equipment.
- D. Install access panel markers with screws on equipment access panels.

3.03 PIPING IDENTIFICATION

- A. Do not use pipe markers and tapes for bare pipes conveying fluids at temperatures of 125 deg F (52 deg C) or higher.
 - 1. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
 - 2. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.04 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:
 - 1. Valve-Tag Size and Shape:
 - a Cold Water: 1-1/2 inches, round.

b Hot Water: 1-1/2 inches, round.

c Gas: 1-1/2 inches, round.

2. Letter Color:

d Cold Water: Black.

e Hot Water: Black.

f Gas: Black.

3.05 ADJUSTING AND CLEANING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.
- B. Clean faces of mechanical identification devices.

END OF SECTION

Part 1 GENERAL

1.01 SUMMARY

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
 - (1) Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
 - (2) Adjusting total HVAC systems to provide indicated quantities.
 - (3) Measuring electrical performance of HVAC equipment.
 - (4) Setting quantitative performance of HVAC equipment.
 - (5) Verifying that automatic control devices are functioning properly.
 - (6) Measuring sound and vibration.
 - (7) Reporting results of activities and procedures specified in this Section.

1.02 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. AMCA: Air Movement and Control Association.
- C. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.03 SUBMITTALS

- A. Strategies and Procedures Plan: Testing, adjusting, and balancing strategies and step-by-step procedures. Include a complete set of report forms intended for use on this Project.
- B. Certified Testing, Adjusting, and Balancing Reports: Prepared on approved forms certified by the testing, adjusting, and balancing Agent.

1.04 QUALITY ASSURANCE

- A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC.

- B. Certification of Testing, Adjusting, and Balancing Reports: Certify testing, adjusting, and balancing field data reports. This certification includes the following:
 - (1) Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
 - (2) Certify that testing, adjusting, and balancing team complied with approved testing, adjusting, and balancing plan and procedures specified and referenced in this Specification.
- C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."
- D. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.
- E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by the instrument manufacturer.

1.05 PROJECT CONDITIONS

- A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.
- B. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.06 COORDINATION

- A. Coordinate efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.07 WARRANTY

- A. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

- (1) The certified Agent has tested and balanced systems according to the Contract Documents.
- (2) Systems are balanced to optimum performance capabilities within design and installation limits.

Part 2 PRODUCTS (Not Applicable)

Part 3 EXECUTION

3.01 EXAMINATION

- A. Examine the Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
 - (1) Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."
- D. Examine equipment performance data, including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with design data and installed conditions.
- E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- F. Examine system and equipment test reports.
- G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are

properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

- H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- I. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible, and their controls are connected and functioning.
- K. Examine plenum ceilings, utilized for supply air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
- L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- M. Examine equipment for installation and for properly operating safety interlocks and controls.
- N. Examine automatic temperature system components to verify the following:
 - (1) Dampers, valves, and other controlled devices operate by the intended controller.
 - (2) Dampers and valves are in the position indicated by the controller.
 - (3) Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
 - (4) Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
 - (5) Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 - (6) Sensors are located to sense only intended conditions.
 - (7) Sequence of operation for control modes is according to the Contract Documents.
 - (8) Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

- (9) Interlocked systems are operating.
- (10) Changeover from heating to cooling mode occurs according to design values.
- O. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.02 PREPARATION

- A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - (1) Permanent electrical power wiring is complete.
 - (2) Hydronic systems are filled, clean, and free of air.
 - (3) Automatic temperature-control systems are operational.
 - (4) Equipment and duct access doors are securely closed.
 - (5) Balance, smoke, and fire dampers are open.
 - (6) Isolating and balancing valves are open and control valves are operational.
 - (7) Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - (8) Windows and doors can be closed so design conditions for system operations can be met.

3.03 TESTING AND BALANCING PROCEDURES

- A. Perform testing and balancing procedures on each system according to procedures contained in AABC national standards.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
- C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.04 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

- (1) Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.
- (2) Air Outlets and Inlets: 0 to minus 10 percent.

3.05 REPORTS

A. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

B. Final Report: Typewritten, or computer printout in letter-quality font, on standard bond paper, bound in three-ring, loose-leaf binder, and tabulated and divided into sections by tested and balanced systems.

- (1) Include a certification sheet in front of binder signed and sealed by the certified testing and balancing agent.
- (2) Include a list of instruments used for procedures, along with proof of calibration.
- (3) Final Report Contents: In addition to certified field report data, include the following:
 - a Fan curves.
 - b Manufacturers' test data.
 - c Field quality-control test reports prepared by system and equipment installers.
 - d Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.
- (4) General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
 - a Title page.
 - b Name and address of testing, adjusting, and balancing Agent.
 - c Project name.
 - d Project location.

- e Architect's name and address.
- f Engineer's name and address.
- g Contractor's name and address.
- h Report date.
- i Signature of testing, adjusting, and balancing Agent who certifies the report.
- j Summary of contents, including the following:
 - 1) Design versus final performance.
 - 2) Notable characteristics of systems.
 - 3) Description of system operation sequence if it varies from the Contract Documents.
- k Nomenclature sheets for each item of equipment.
- l Data for terminal units, including manufacturer, type size, and fittings.
- m Notes to explain why certain final data in the body of reports vary from design values.
- n Test conditions for fans and pump performance forms, including the following:
 - 1) Settings for outside-, return-, and exhaust-air dampers.
 - 2) Conditions of filters.
 - 3) Cooling coil, wet- and dry-bulb conditions.
 - 4) Face and bypass damper settings at coils.
 - 5) Fan drive settings, including settings and percentage of maximum pitch diameter.
 - 6) Inlet vane settings for variable-air-volume systems.
 - 7) Settings for supply-air, static-pressure controller.
 - 8) Other system operating conditions that affect performance.
- (5) System Diagrams: Include schematic layouts of air distribution systems. Present with single-line diagrams and include the following:

- a Quantities of outside, supply, return, and exhaust airflows.
- b Duct, outlet, and inlet sizes.
- c Terminal units.
- d Balancing stations.

3.06 ADDITIONAL TESTS

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

Start-up Check Sheet

Owner Name: Fontana Unified School District Dealer Name: _____

Address: _____ Address: _____

City,State, Zip: _____ City,State,Zip: _____

Model Number: _____ Serial Number: _____

Date: _____ Technician: _____

Type of Unit Gas/Electric _____ Heat Pump _____

Supply Voltage L1-L2 _____ L2-L3 _____ L3-L1 _____

Compressor Amps L1 _____ L2 _____ L3 _____

Indoor-Fan Amps L1 _____ L2 _____ L3 _____

Blower Speed Checked? _____ Belt Alignment Checked _____

Calculated or Measured CFM: Heating _____ Cooling _____

Filter Size and Type _____ Belt Size _____

Temperature Split: Supply Air _____ DEG. F Return Air _____ DEG. F

Gas Inlet Pressure: _____ IN WG Gas Manifold Pressure: _____ IN WG (HI FIRE)

Refrigerant Suction: _____ PSIG Refrigeration Discharge: _____ PSIG

Date of Start-up: _____

Economizer

Model Number: _____ Serial Number: _____

Enthalpy Sensor Setting: _____

Powered Exhaust (Yes) (No) If so Amp draw _____ & Belt size _____

Date: _____ Technician: _____

END OF SECTION 23 05 93

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
 - 1. Supply and return air ducts for heating and cooling systems air ducts.
 - 2. Plumbing piping and equipment including hot and tempered domestic water supply and return piping.
- C. Related Sections:
 - 1. Section 15010: Basic Mechanical Requirements.
 - 2. Section 15050: Basic Mechanical Materials and Methods.
 - 3. Section 15075: Mechanical Identification.
 - 4. Section 15700: Heating, Ventilating and Air Conditioning Equipment.
 - 5. Section 15800: Air Distribution.

1.02 REFERENCES

- A. American Society for Testing and Materials International:
 - 1. ASTM C167 - Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
 - 2. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.
 - 3. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - 4. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 5. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

6. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
7. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
8. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
9. ASTM C739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.
10. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
11. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
12. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
13. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests.
14. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Underwriters Laboratories, Inc.:

1. UL 181 - Factory-Made Air Ducts and Air Connectors.
2. UL 723 - Test for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems .
2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
3. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

- A. Submit in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.
 - 1. Complete material list of items to be furnished and installed under this section.
 - 2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.
 - 3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.
 - 4. Display sample cutaway sections.
 - 5. Manufacturer's recommended method of installation procedures, which will become part of this Specification section.

1.04 QUALITY ASSURANCE

- A. Qualifications of Manufacturer and Installer, Workmanship and Standard of Quality: Comply with provisions stated under Section 15010: Basic Mechanical Requirements and Section 15050: Basic Mechanical Materials and Methods.
- B. Insulation Work shall be in accordance with the State of California Building Energy Efficiency Standards, CBC, and Uniform Mechanical Code.
- C. Test Ratings:
 - 1. Comply with provisions stated under Section 15010 and 15050 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or listing of satisfactory test results from the National Bureau of Standards, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.
 - 2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.
 - 3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.

4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.
- D. Regulatory Requirements: Insulation furnished and installed under this section shall meet minimum legal requirements of the Building Energy Efficiency Standards adopted and incorporated in the California Energy Commission, Title 24, Part 2, Chapters 2 through 53, unless otherwise noted, for the piping, ductwork, and equipment.
- E. All chemically based products such as sealers, primers, fillers, adhesives, etc. must meet the California air quality regulations.

1.05 PRODUCT HANDLING

- A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 15010: Basic Mechanical Requirements and 15050: Basic Mechanical Materials and Methods.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 1. Insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.
 2. Insulating material shall be furnished with thickness indicated in Table 1, and shall furnish thermal resistance in the range of R 4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.
 3. Asbestos in any quantity in insulating material is not permitted.
 4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:
 - a. Nylon anchors for installing insulation to ducts or equipment.
 - b. Treated wood blocks.
 5. Flameproofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)

Insulation Thickness Required (in inches)

Space Heating Systems (Steam, Steam Condensate and Hot Water)

Piping System Type	Temp. Range (degrees F)	Runouts up to 2 (2)	1 and less	1.25-2	2.5-4	5-6	8 and larger
Service Water Heating Systems (recirculating, piping supply and return)							
Hot Water	Up to 180	0.5	1.0	1.0	1.5	1.5	1.5
Space Cooling Systems (Chilled water, Brine and Refrigerant)							
Refrigerant/Brine	Below 40	1.0	1.0	1.5	1.5	1.5	1.5
Condensate Drain	1/2 inches Minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From A/C Equipment:	Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES: (1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(2) Runouts to individual terminal units, not exceeding 12 feet in length.

- B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.
- C. Canvas Jackets: Furnish 6 oz. in accordance with square foot minimum, 48 x 48 thread count canvas jacketing.
- D. Insulation Jackets:
 - 1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be

furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.

2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of 1/2 inch to 8 inches shall be provided with Childers aluminum Ell-Jacs insulation covers, or equal, manufactured from 1100 aluminum alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10 inches to 18 inches shall be provided with Childers 4-piece aluminum Ell-Jacs.
 3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, or equal.
- E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA Standard 90-A & 90-B and has been tested according to relevant ASTM requirements and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.
- F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, or equal.

2.02 DUCTWORK AND PLENUM INSULATION

- A. General: Insulate ductwork and plenums with not less than the amount of insulation tabulated in Table 4. Insulation may be omitted under the following conditions:
1. Exposed return air ductwork in conditioned space.
 2. Return air ductwork between wall studs inside an interior wall.

TABLE 4 - INSULATION OF DUCTS AND PLENUM

INSULATION TYPES

<u>Duct Location</u>	<u>Heating and Cooling</u>
On roof or exterior of building	L2
Attics, Garages, and Crawl Spaces	F-3 or L-2 See Note 3
In walls, within floor-ceiling spaces	F-1 or L-1 See Note 3
Hot and cold plenums	F-2 or L-2 See Note 3
Within unconditioned space or in basement	F-3 or L-2 See Note 3

B. Insulation Types:

1. F-1: 1 ½" blanket fiberglass, factory-laminated with all-service jacket vapor barrier.
2. F-2: 2 inch blanket fiberglass, factory-laminated with all service jacket vapor barrier.
3. F-3: 3 inch blanket fiberglass, factory-laminated with all service jacket vapor barrier.
4. L1: 1 inch internal duct lining. Flexible type for ducts and rigid board for plenums.
5. L2: 2 inch internal duct lining. Flexible type for ducts and rigid board for plenums. Duct joints shall be waterproofed.

C. Notes:

1. Minimum insulation provided shall be as required by the current CAC Title 24 for the most restrictive condition.
2. Refer to the materials indicated in this section for external insulation and internal lining, this section, below.
3. External insulation shall be replaced with internal duct lining (of equivalent thermal resistance value unless noted otherwise) where indicated on the drawings or specified elsewhere for sound attenuation.

4. Provide internal duct lining (1 inch unless noted otherwise) where indicated on the drawings or specified elsewhere for sound attenuation.

D. Materials:

1. Fire-Resistive Insulation Materials and Coatings: Submit State Fire Marshal pre-approved materials only.
2. Adhesives: See Article 2.01, E for applicable products.
3. External Insulation: Provide glass fiber blankets that are factory-laminated with reinforced foil Kraft (FRK) vapor barrier facing; Johns Manville Microlite, Owens Corning all-service faced duct wrap, Ultralite No. 100, Pittsburgh Plate Glass Superfine, or Silvercote Silvercel. Provide a minimum installed R value as required by the latest edition of the California Energy Efficiency Standards; but not less than scheduled below:

TABLE 5
INSULATION OF DUCTS AND PLENUM INSTALLED
THERMAL RESISTANCE "R" VALUES

Type	Labeled Thickness	Installed R Value (hr.ft ² .°F/Btu)
F1	1 ½"	4.2
F2	2"	5.6
F3	3"	8.3
L1	1"	4.2
L2	2"	8.3

4. Internal Lining: Johns Manville Permacote® Linacoustic ® and/or Permacote® Spiracoustic®, Owens Corning QuietR® acoustic duct liner and liner board, or equal. Internal lining shall conform to:
 - a. Fire Safety Standards: NFPA 90A and 90B.
 - b. Operating Temperature: ASTM C411.
 - c. Air velocity: ASTM C1071, UL 181.
 - d. Fire Hazard Classification: ASTM E84, UL 723-Class 1, NFPA 255.
 - e. Corrosion Resistance: ASTM C739 and ASTM C665.
 - f. Fungi Resistance: ASTM G21.
 - g. Water Vapor Sorption: ASTM C1104, less than 1% by weight.

- h. Formaldehyde, Phenolic Resins or other Volatile Organic compounds: 0%.
- i. Minimum R value as required by the latest edition of the California Energy Efficiency Standards, but not less than 4.0 at 75 degrees F.
- j. Acoustical Performance: ASTM C423 & ASTM E795 Minimum NRC of 0.75 for interior spaces Minimum NRC of 0.90 for exposed to weather.
- k. Hot and cold plenums separated by single partition: Minimum NRC of 0.75, both sides.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.
- B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.
- D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where firestop or firesafing materials are required.
- E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.
- F. Insulation shall not be installed in the following locations unless otherwise noted:
 - 1. On vacuum return lines less than 50 feet long.
 - 2. On unions, flanged connections or valve handles.

3. Over edges of any manhole, clean-out hole, clean-out plug, access door or opening to a fire damper, so as to restrict opening or identification of access.
4. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.02 INSTALLATION OF COOLING PIPING SYSTEM INSULATION

- A. General: Chilled water supply and return piping, refrigerant piping and condensate drain lines, after having been tested, shall be cleaned and insulated.
- B. Application: Insulation on chilled water lines, refrigerant suction lines and liquid lines, if indicated, and air conditioner interior drain lines shall be jacketed with fire-resistant vapor barrier of laminated aluminum foil consisting of 2 plies with glass-yarn reinforcing. Jacket joints shall be lapped and sealed with an approved adhesive. Insulation shall be secured with aluminum bands not less than 0.005 inch thick by 3/4 inches wide, spaced not over 12 inches on centers, or as recommended by manufacturer.
 1. Longitudinal Seams: Butt hinged sections of covering tightly together and seal down jacket flap with adhesive, or with factory-applied, self-sealing lap with pressure-sensitive sealer protected with release paper.
 2. End Joints: Wrap joint with a 3-inch wide (minimum) self-sealing tape.
 3. Fittings and Valves: Fittings and valves shall be covered with same material of same thickness as pipe insulation, sealed with an approved, vapor-sealing tape or compound and covered with Zeston polyvinyl-chloride cover.
 4. Pipe hangers shall be insulated or attached to pipe by an insulating insert, butted between adjoining insulation sections.
- C. Additional Jackets:
 1. Exposed Indoor Insulation: Cover with 26 gage galvanized sheet metal jacket to 8 feet above floors, except in mechanical equipment rooms and accessible pipe tunnels.
 2. Exposed Outdoor Insulation: In addition to canvas or fiberglass cloth cover, provide 0.016 inch thick aluminum jacket with one inch wide aluminum bands and seals. Install appropriate jackets on valves and fittings.

A. External Covering:

1. Before installing duct insulation, sheet metal ducts shall be clean, dry, and tightly sealed at joints and seams.
2. Duct exterior insulation shall be firmly wrapped around ductwork with joints lapped a minimum of 2 inches. Insulation shall be securely fastened with 18 gage copper-lined steel wire, or 16 gage soft-annealed galvanized wire spaced approximately 12 inches on centers and at loose ends, presenting a neat and workmanlike appearance. Where duct width is such that wiring will not fasten insulation firmly against duct an adhesive shall be furnished to fasten insulation to duct with wiring being installed at ends of insulation segment.
3. Duct insulation in finished rooms shall be covered with wrapped fiberglass cloth cover. Install on each corner of duct 26 gage galvanized steel small nose, wide flange corner bead of appropriate height. In unfinished rooms, the insulation shall have a vinyl or similar coating. In all rooms, insulation shall be fastened to the ducts with an approved adhesive instead of wire. Corners shall be cut and formed instead of bending the insulating material. Raw edges shall be taped.
4. Insulation on ductwork transporting conditioned air, both supply and return, and outside air intake ducts shall be furnished with a factory-applied, fire-resistant vapor barrier.
5. Exposed Ducts or Plenum:
 - a. Install insulation to ducts or plenum furnished with butt joints, without voids and with adhesive over entire surface of duct. Cover insulation with canvas jacket, fastened tightly to insulation with lagging adhesive. Install 2 finish coats of undiluted adhesive.
 - b. When installing jacket, finished covering shall be even and level, without humps, with constant diameters on round ducts maintained.
 - c. For non-lined insulated ducts or plenums exposed to weather: Insulation finish shall be 0.016 inch thick aluminum sheet with joints lapped not less than 3 inches, sealed, and secured with 6 gage by 3/8 inches

aluminum sheet metal screws, or aluminum handgun-type rivets.

B. Lining General:

1. Floors of cold plenums and fan enclosure plenums shall not be insulated.
2. Cover short damper sections on lined ducts on outside to permit free operation of dampers and linkage.
3. Dimensions of ducts indicated are net inside dimensions and must include thickness of duct liners to obtain the required duct size.
4. Install insulation in square turns, where required, to cover interior surfaces before duct turns are installed.

C. Interior insulation (lining) of ducts shall be as specified in above.

1. Liner material installed during fabrication of duct with sealed face only exposed to air stream. Insulation shall be fastened to sheet metal with an approved fire-retardant adhesive, with minimum 90 percent coverage and edges firmly adhered. Mechanical fasteners shall supplement the adhesive on top sections of ducts more than 12 inches wide and on sides of ducts more than 24 inches high and shall be spaced on 16-inch centers maximum. Fastener posts shall be cut off approximately 1/4 inch from metal disc.

D. Interior insulation in ducts or plenums shall not have exposed edges. Edges open to entering or leaving air streams shall be covered, secured in place and sealed with approved duct liner edge sealers.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION 23 07 00

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General requirements for Commissioning (Cx) of HVAC systems and equipment including installation, start-up, testing, documentation, and training according to the Construction Documents.
- B. Standard procedures for the execution of commissioning work shall be in conformance with Division 1, Section 01810 General Commissioning Requirements. Coordinate all work with the Commissioning Agent (CxA).

1.02 RELATED SECTIONS

- A. Related sections:
 - 1. Provisions of Division 01 apply to this Section.
 - 2. Section 01400: Quality Assurance / Quality Control
 - 3. Section 15990: Test and Balance.
 - 4. Section 01810: General Commissioning Requirements.
 - 5. Section 01820: Maintenance & Operations Staff Demonstration and Training.
 - 6. Section 15010: Basic Mechanical Requirements.
 - 7. Section 15738: Heating, Ventilation, and Air Conditioning Equipment.
 - 8. Section 15800: Air Distribution
 - 9. Section 15875: Carbon Monoxide Detection and Alarm Systems.
 - 10. Section 16010: Basic Electrical Requirements.
 - 11. Section 16050: Basic Electrical Materials and Methods.
 - 12. Section 16060: Grounding and Bonding.
 - 13. Section 16120: Low Voltage Wires (600 Volt AC).
 - 14. Project Commissioning Plan (CxP)

1.03 REFERENCES

A. Applicable codes, standards, and references: all inspections and tests shall be in accordance with the following applicable codes and standards, except as provided otherwise herein:

1. National Electrical Testing Association – NETA.
2. National Electrical manufacturer's Association – NEMA.
3. American Society for Testing and Materials – ASTM.
4. Institute of Electrical and Electronic Engineers – IEEE.
5. American National Standards Institute – ANSI.
6. National Electrical Safety Code – NESC.
7. California Building Code – CBC.
8. California Electrical Code – CEC.
9. California Mechanical Code – CMC.
10. Insulated Power Cables Engineers Association – IPCEA.
11. Occupational Safety and Health Administration – OSHA.
12. National Institute of Standards and Technology – NIST.
13. National Fire Protection Association – NFPA.
14. American Society of Heating and Air Conditioning Engineers – ASHRAE
(The HVAC Commissioning Process, ASHRAE Guideline).
15. Associated Air Balance Council – AABC
(National Standards for Total System Balance).
16. Uniform Mechanical Code – UMC.
17. Uniform Plumbing Code – UPC.

1.04 SUBMITTALS

A. Submittals package(s) shall include the following:

1. Commissioning required submittals in accordance with Division 01 Specification Sections.

2. Copy of the Architect's reviewed and accepted submittals to the CxA via the OAR.
3. List of team members who will represent the Contractor in the Pre-functional Equipment Checks (PEC) and Functional Performance Tests (FPT), at least six (6) weeks prior to the start of Pre-functional Equipment Checks.
4. Detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, a copy of full details of Owner-contracted tests, full factory testing reports, if any, and Warranty information, including responsibilities of Owner to keep Warranty in force clearly defined.
5. Installation and checklist documentation shipped with equipment and field checklist forms to be used by factory or field technicians.
6. Detailed manufacturer's recommended procedures and schedules for PECs, supplemented by Contractor's specific procedures, and FPTs, at least four (4) weeks prior to the start of PEC.

1.05 MEETINGS, SEQUENCING AND SCHEDULING

- A. Meetings: Attend the Cx meetings as required under Section 01810 and Cx Plan.
- B. Sequencing and Scheduling: The work described in this Section shall begin only after all work required in related Divisions 15 and 16 Sections has been successfully completed and all tests, inspection reports, and Operation & Maintenance manuals required have been submitted and accepted. The start-up and PEC shall be completed and submitted to the Owner at least two weeks prior to beginning FPT.
 1. Coordinate all HVAC work with the work of other trades prior to scheduling of any Cx procedures.
 2. Coordinate the completion of all HVAC testing, inspection, and calibration prior to start of Cx activities.

1.06 QUALITY CONTROL

- A. Comply with the Owner's Quality Control Specifications, sections 01400-01405.
- B. Incorporate manufacturer's recommended Cx procedures for the systems and equipment to be commissioned under this section.

1.07 EQUIPMENT AND SYSTEMS TO BE COMMISSIONED

- A. Split Systems
- B. Fan Coil Units
- C. Single Package Gas Heating Electric Cooling Units
- D. Wall Mount Heat Pump Units

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. Equipment to be utilized in the commissioning process shall meet the following requirements:
 - 1. Provide test equipment as necessary for the testing of the equipment and systems to be commissioned.
 - 2. Provide testing equipment and accessories that are free of defects and certified for use.
 - 3. Provide testing equipment with current calibration labels as per NIST Standards.
 - 4. Equipment shall be calibrated on the manufacturer's recommended intervals with calibration tags affixed to the instrument. In the absence of calibration tags, calibration documentation shall be submitted to the CxA at least thirty (30) days prior to use; this documentation shall include description and serial number of instrument and calibration data and date.
 - 5. All testing equipment shall be maintained in good operating condition for the duration of the project.

PART 3 – EXECUTION

3.01 COMMISSIONING PROCESS REQUIREMENTS

- A. Work to be performed prior to commissioning:
 - 1. Complete all phases of the work so the system(s) can be started, tested, adjusted, balanced, and otherwise commissioned.
 - 2. If modifications or corrections to the installed system(s) are required to bring the system(s) to acceptance levels due to Contractor's incorrect installation or defective materials, such modifications shall be made at no additional cost to the Owner.
 - 3. Normal start-up services required to bring each system into full

operational state:

- a. Testing, motor rotation check, control sequences of operation, full and part load performance.
- b. Commissioning shall not start until each system is complete and start-up has been performed.

B. Pre-Commissioning responsibilities:

1. Inspection, calibration and testing of the equipment required to commission the following systems:
 - a. HVAC System(s).

C. Commissioning Process Requirements:

1. Refer to Section 01810 General Commissioning Requirements and related sections for information on meetings, start-up plans, Pre-Functional and FPT, operations & maintenance data, training requirements, and other Cx activities.

3.02 PREPARATION

- A. Provide certified HVAC technicians as required, with tools and equipment necessary to perform all Cx activities specified.
- B. Provide certified testing agency personnel and equipment factory representatives as require in the Cx plan and other related sections.
- C. Verify that all work required in this section and in Section 01810 is complete prior to starting of FPT.
- D. Verify that complete operational manuals have been reviewed and accepted by the CxA as specified before starting FPT.

3.03 TESTING

- A. Testing procedures shall include the following minimum information:
 1. Test number.
 2. Equipment used for the test, with manufacturer and model number and date of last calibration.
 3. Date and time of the test.

4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 5. Identification of the system, subsystem, assembly, or equipment.
 6. Conditions under which the test was conducted, including (as applicable); ambient conditions, set points, override conditions, status, and operating conditions that impact the results of the test.
 7. Systems and assemblies test results and performance and compliance with contract requirements.
 8. Issue number, if any, generated as the result of the test.
 9. Name(s) and signature(s) of witnesses and the person(s) performing the test.
- B. Contractor shall participate and perform all Cx related testing requirements as specified.
- C. General Requirements for Mechanical, Controls, and Testing and Balance:
1. Construction and Acceptance Phases:
 - a. Provide assistance to CxA in preparing FPT procedures specified. Sample test forms are include in the project Cx Plan.
 - b. Develop full startup and initial checkout plan using manufacturer's start-up procedures and all Cx checklists for all commissioned equipment. Submit to CxA for review and approval prior to startup.
 - c. During startup and initial checkout process, execute mechanical-related portions of PEC for the equipment and systems to be commissioned.
 - d. Perform and clearly document completed startup and system operational checkout procedure. Providing (4) four copies of the results to the Owner.
 - e. Resolve any open punch list items before FPT. Air testing and balance shall be completed with discrepancies and problems remedied before FPT of respective air -related systems.

- f. Provide skilled technicians to execute starting of equipment and to execute PFT. Ensure that technicians are available and present during agreed upon schedules and for sufficient duration to complete necessary tests, adjustments, and solutions to identified problems.
- g. Maintain a log of events and issues of tests and all related Cx activities. Submit handwritten reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests, and lists of completed tests as specified.
- h. Correct open issues and re-test as needed to prove compliance with system operational standards.
- i. Prepare Operation & Maintenance Manuals and provide training for the District maintenance personnel and end-users per Section 01820.
- j. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of Warranty and notify the Owner.
- k. Execute simulated seasonal FPT, witnessed by the Owner and the CxA, as specified. Document all results and perform corrections as needed for system acceptance and make necessary adjustments to Maintenance & Operations Manuals and Record Drawings.

3.04 SENSOR CALIBRATION

- A. Field-installed temperature, relative humidity, CO₂, pressure sensors, pressure gages, and actuators (dampers and valves) shall be calibrated using the methods described below. Calibration procedures shall be documented during execution of the Start-up and the PEC. Alternate methods may be used, if approved by the CxA.
- B. Test instruments shall have had a NIST certified calibration within the last 12 months. Sensors installed in the unit at the factory with provided calibration certification need not be field calibrated.
- C. Sensors:
 - 1. Verify that sensor locations are appropriate and away from causes of erratic operation.
 - 2. Verify that sensors with shielded cable are grounded only at one end.

3. For sensor pairs that determine a temperature difference, make sure they are reading within 0.2°F of each other.
4. For sensor pairs that determine a pressure difference, make sure they are reading within 2% of each other.
5. Calibration: Put the equipment in operation. Make a reading with a calibrated test instrument within six inches of the site sensor. Verify that the sensor reading (via the permanent thermostat or gage) is within the tolerance listed in the table below of the instrument-measured value. If not, calibrate or replace sensor.

6. Tolerances:

<u>Sensor</u>	<u>Required Tolerance (+/-)</u>
AHU wet bulb or dew point	2.0°F
Outside air, space air, duct air temps	0.4°F
Watt-hour, voltage & amperage	1% of design
Pressures, air, water and gas	3% of sensor range (inc. design value)
Flow rates, air	10% of sensor range (inc. design value)
Flow rates, natural gas	5% of sensor range (inc. design value)
Relative humidity	4%
CO ₂ monitor	100 ppm
Sound level	5 db - Type 1 meter (Per Calibrator Mfg.)
Domestic Hot Water Temperature	1.5 °F
Domestic Hot Water Pressures Water & Gas	3% of sensor range (inc. design value)
Flow Rates, Domestic Water	4% of sensor range (inc. design value)

3.05 ADJUSTING

- A. Systems improperly adjusted; incorrectly installed equipment and/or deficient Contractor's performance may result in additional work being required for commissioning acceptance.
 - 1. Contractor shall perform all work required to correct installations not meeting contract requirements at no additional cost to the Owner.
- B. Corrective work shall be completed in a timely manner to permit completion of the Cx process.
- C. If systems' Cx deadline, as defined in the Project Schedule, goes beyond the scheduled completion without resolution of the problem(s), the Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem.

3.06 TRAINING

- A. Provide training as required in applicable Division 15 specification sections and section 01820.

END OF SECTION

PART 1 GENERAL

1.0 RELATED SECTIONS

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents. Consult the above for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.

1.01 CONTROL SYSTEM DESCRIPTIONS

- A. The Building Automation System (BAS) shall be as indicated on the drawings and described in these specifications. System shall include a network of commercial Internet-programmable thermostats, their accessories, and any other networked devices required for complete climate management. Devices shall communicate across a wireless network using IEEE 802.15.4 technical standards. Wireless communication shall be of an automated mesh communication type, which self-establishes network addresses, communication routes, and all other setup requirements to establish connection across the entire campus. A single Ethernet-connected Gateway shall be able to connect the wireless mesh network to the Internet, allowing for climate management through a cloud based web-application. This network design is to be used to isolate the BAS from the owner's private Ethernet network (LAN) and/or WiFi networks. IEEE 802.11 or any other wireless standard of communication or a wired network communication protocol between devices is not acceptable by these BAS specifications. The Gateway is to connect to a single outbound Ethernet connection on the owner's wide area network (WAN) over a TCP/IP connection. The owner's firewall shall not require any inbound port assignments for the Gateway to connect to the cloud servers. The Gateway shall not require a Public IP and it shall not run any standard available operating systems, such as Windows or Linux.
- B. Access and control of BAS shall be through a web-based graphical management platform. The BAS platform shall sit on a cloud server and be accessible on both local personal computers and remotely by use of a web-browser that supports HTML5 or later.
- C. No on-site servers are to be installed or used for the BAS. No licensing fees or future licensing fees shall be required as part of the BAS. These specifications and guidelines are to create a cohesive and secure network that provides full management over the facility's climate through the cloud BAS.

- D. The BAS shall accommodate an unlimited simultaneous multiple-user operation. Access to the BAS shall be limiting based on security permissions of each operator's role managed by owner site Administrators.

1.02 APPROVED BUILDING AUTOMATION SYSTEM MANUFACTURERS

- A. Pelican Wireless Systems

1.03 SUBMITTALS

- A. Shop drawings and manufacturer's standard specification data sheets on all hardware shall be provided for this project. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications.
- B. All submittals shall be bound, in a three-ring binder, or provided digitally on a USB stick with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect or Engineer for distribution and review.
- C. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring (installed by others) to be controlled by system and locations of thermostats, gateways, and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by others, required for proper installation of systems of this section.
- D. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.
- E. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

1.04 SYSTEM STARTUP & COMMISSIONING

- A. Each BAS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Documentation shall be provided to the owner that proves installation and testing has been completed and points out any mechanical issues found which are not related to the installation of the BAS. Successful completion of the system tests shall constitute the beginning of the warranty period.
- B. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor

shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to the BAS.

C. Upon completion of installation, submit three (3) copies of record documents. The documents shall be submitted for approval prior to final completion and include:

1. Testing and Commissioning Reports and Checklists signed off by trained field commissioning personnel.
2. Name, address and telephone number of Contractor personnel managing and installing equipment, along with service personnel responsible for supporting the ongoing warranty and services of the control system.
3. Procedures for operating the BAS, including logging on/off, alarm management, reading reports, trends, modification of setpoints, scheduling, and other interactive system requirements.
4. Provide information on how to receive support from Pelican Wireless Systems and communicate that they are a direct supporting resource. Contact information for Technical Support from Pelican Wireless Systems is to be provided.

1.05 CODES AND STANDARDS

A. Codes and Standards. Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section:

1. California 2016 Title 24 Compliant
2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified
3. OpenADR 2.0 certified

1.06 TRAINING

A. The BAS Contractor shall provide training for two (2) owner representatives and/or maintenance personnel. The BAS Contractor shall provide on-site training to the District's representative(s) and maintenance personnel per the following description:

- B. On-site training shall consist of a minimum of (1) hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include:

1. System Overview
2. System Application and Operation
3. System Access
4. Application Features Overview
5. Changing Set Points and other attributes
6. Scheduling
7. Editing configurable variables
8. Graphics
9. Viewing Historical Reports
10. Operational sequences including start-up, shutdown, adjusting and balancing
11. Equipment maintenance

1.07 OPERATING AND MAINTENANCE MANUALS

- A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire BAS.
- B. Following project completion and testing, the BAS contractor will submit as-built documentation reflecting the exact installation of the system.

1.08 WARRANTY

- A. The BAS contractor shall warrant the system for 12 months after system acceptance and beneficial use by the owner. During the warranty period, the BAS contractor shall be responsible for all necessary revisions as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. BAS equipment shall include a limited-warranty by the manufacturer for a period of five (5) years from the time of system acceptance.
- B. Limited-warranty by manufacturer is limited to replacement of defective products.

1.09 WORK BY OTHERS

- A. The BAS Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work prior to fabrication and installation. The owner's representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. BAS Contractor shall provide field supervision to the Mechanical Contractor for pre-installation of control components.
- B. Low-voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by others. Unless otherwise noted all new low-voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacturer's Installation Instructions) installed per owner's specifications. (Wiring in existing installations shall be minimum three (3) conductor/18-gauge wires per BAS manufacturer's standard specifications, multiple conductor/18-gauge thermostat wiring preferred - see Installation Instructions for specific conductor counts depending on heating and cooling modes of existing equipment.)
- C. Related work provided by others:
 - 1. 110V outlets shall be provided within five (5) feet of each Gateway or Wireless Repeater location.
 - 2. One (1) Ethernet data port shall be provided within ten (10) feet of each Gateway location.
- D. Equipment start-up and servicing.

1.11 SCOPE OF WORK

- A. Except where otherwise noted, the system shall consist of a network of commercial Internet-programmable thermostats, their accessories, and any other networked climate management device(s) required to fill the intent of the specification, sequence of operations, and provide for a complete and operable system.
- B. The BAS contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to bidding and submittal of a bid/price and notify the owner immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.
- C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this BAS contractor.

- D. When the BAS is fully installed and operational, the BAS contractor will make themselves available to meet with the designated representatives of the owner to review the as-installed condition of the system. At that time, the BAS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.
- E. The BAS contractor shall furnish and install a complete BAS control system, including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification.
- F. Provide and install BAS controls for the HVAC Equipment as noted on the drawings.
- G. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor, and the owner's team.
- H. Shall provide one training session in the operation of the system for owner's personnel.
- I. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction.

PART 2 PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

- A. Unless otherwise noted, all product shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems.

2.01 COMMUNICATION

- A. This project shall be comprised of a network of devices that use an IEEE 802.15.4 self-creating and self-healing wireless mesh communication network to reach an Ethernet Gateway.
- B. The Gateway shall communicate to cloud servers via a single Ethernet connection at the owner's wide area network (WAN) over a TCP/IP connection. The facility's firewall shall not require any inbound port assignments for the Gateway to connect to the cloud servers. The Gateway shall not require a Public IP.
- C. No BACnet, modBus, LON, or any other device-to-device wired communication protocol shall be used in the communication network.

2.02 OPERATOR INTERFACE

- A. The BAS shall be controlled, managed, and configured using a Web-App on any personal computer, smartphone, and/or tablet that runs a browser with HTML5 or newer.
- B. The Web-App platform shall run on cloud servers which allow for virtual access. Platform shall not run on a local on-site server.
- C. The Web-App shall support at a minimum, the following functions:
 - 1. Personal user log-on identifications (email addresses) and unique passwords shall be required.
 - 2. Custom HTML programming shall not be required to display any graphics, data, or build the Web-App. There shall be no development cost, commissioning costs, or software upgrade cost required to obtain and use the Web-App.
 - 3. Storage of historical data shall reside on the cloud server and shall not sit within the client's computer, internal network, or other devices. A BAS, which requires on-site data storage, is not acceptable.
 - 4. System shall allow for administrator and user defined access privileges.
 - 5. A Push/Pull OpenAPI interface with XML data output shall be available.
 - 6. Servers shall not run a Windows operating system.
- D. Control and Override
 - 1. The BAS shall provide view, override, and edit of the status of any object and property in the system. The status of the device shall be defined graphically and shall not require any custom programs or programming.
 - 2. Temporary Overrides. The BAS shall be able to provide temporary override (wherever an override is allowed) and automatically remove the override after a specified period of time.
 - 3. Any override and edit of a object virtually or at the device, if allowable, shall be historically tracked.
- E. Scheduling
 - 1. The BAS shall provide users with scheduling of application devices through a graphical interface. Scheduling shall include, but is not limited to:
 - i. Occupied/Unoccupied Schedules. Shall allow 12 scheduled set-time changes in a single day, be configurable for Daily, Weekly, and Weekday/Weekend layouts, and shall be able to be unique to

individual devices or easily shared between multiple devices, where applicable.

- ii. Event Schedules. Shall allow for advanced one-time or repeating event type schedules. Event schedules shall override Occupied/Unoccupied Schedules. After the Event schedule ends, the device shall revert back to the Occupied/Unoccupied Schedule automatically.
- iii. Vacation Schedules. A 360-day Calendar shall provide override of schedules during vacation days. Thermostats shall be able to automatically or be manually switched to follow Vacation Schedules instead of Occupied/Unoccupied Schedules.

F. Alarm Notification

- 1. Alarm Notification(s) shall be generated if there are failures detected by devices part of the BAS. These failures shall be, but are not limited to: temperature deviations, temperatures missing targets, temperatures too high or too low, failures of equipment, etc. Alarm Notification(s) shall be posted on the BAS and shall be able to be sent either via email or text message to an unlimited number of users.

G. Reports and Logs

- 1. Data shall be logged and stored on cloud servers for all devices part of BAS in real-time. Every device real-time "state change", when applicable, shall be stored and viewable for at least one week, with the option of up to two (2) years.
 - i. Each space temperature
 - ii. Each temperature set point(s)
 - iii. Each current call: heat, cool, number of stages, fan, economizer, etc.
 - iv. Each damper position
 - v. Each valve position
 - vi. Each CO² change
 - vii. Each CO² setting
 - viii. Each current call for ventilation due to high CO²
 - ix. Each Humidity change

- x. Each Humidity set point
 - xi. Each current call for dehumidification or humidification.
 - xii. Each Fan speed adjustment
 - xiii. Supply duct static pressure
 - xiv. Supply, Return, Outside air temperatures
2. Data shall be represented on historical graphs that allow for easy viewing of device state change at different times.
 3. Excel outputs shall not be required to view data. Historical data shall be viewable through BAS.

2.03 APPLICATION-SPECIFIC CONTROLLERS

- A. Application Specific Controllers shall not require custom programming and shall control specific equipment through simple configuration settings done through the cloud-based BAS. All configuration changes shall automatically upload into the device once set on the BAS and shall be stored by the device's internal memory.
- B. Gateways are devices which connected to an Ethernet port and act as a bridge between the BAS cloud servers and the wireless mesh network.
 1. Shall be capable of providing Internet connection to up to 2,000 devices.
 2. Shall be capable of automatically addressing routing tables to all devices part of wireless mesh network and shall not require manual programming or addressing.
 3. Shall communicate to cloud servers over a TCP/IP outbound-only connection.
 4. Shall not require a Public IP address, custom VPNs, or any on-site servers.
 5. Shall communicate to other BAS devices over the dedicated and isolated 802.15.4 IEEE technical standard.
 6. Shall be secured using AES (Advanced Encryption Standards).
- C. Internet-Enabled Thermostats are controllers which detect a space/zone temperature and operate equipment or dampers which supply heating, cooling, ventilation, or a combination of the three mechanical states, to their space/zone. Examples are thermostats for VAV, VVT, Fan-Powered Boxes, Fan Coil, Blower Coils, Unit Ventilators, Heat Pumps, Water Source Heat Pumps, and Conventional DX and/or Gas heat equipment.

1. Shall be capable of providing 24VAC outputs which can be configured to provide control of the following: two stages of fan, three stages of cooling, two stages of heating, one stage of auxiliary heat (heat pumps), floating point zone dampers, two position zone dampers, floating point zone reheat valves, and two position zone reheat valves.
2. Shall include a removable wiring terminal module that allows for thermostat installation even in situations where there are only three wires between equipment and where the thermostat is to be installed.
3. Shall be available with the following internal sensors: temperature only, temperature and humidity, temperature, humidity, and CO², and temperature and CO². All sensors required by the specifications are to be internal to the thermostat and not require two devices on the wall.
4. Shall be able to accept expansion accessories that allow for more advanced control sequences, and additional temperature detection. Examples are economizer controllers, outside air ventilation control, supply air temperature detection, unit ventilator face/bypass control, and modulating control. All expansion accessories shall be Internet enabled and accessible through EMS.
5. Shall communicate with the wireless mesh network through an internal wireless antenna that runs on the 802.15.4 technical standards.
6. Shall be able to automatically repeat the wireless mesh network to additional devices part of the BAS.
7. Shall automatically push, in real-time, to the BAS all "state changes" so as to be viewable historically and in real-time from BAS. Examples are changes in equipment operation (heat, cool, fan), number of stages active, the temperatures in the space, damper position, valve position, temperature set-points, etc.
8. Shall be able to lock-out heat pump compressor(s) based on outside air temperature.
9. Shall provide set-point (heat & cool) temperature limitations through BAS.
10. Shall provide full local keypad lock-out from BAS.
11. Shall meet California 2016 Title 24 code standards.
12. Shall have a programmable three (3°F) degree heat/cool temperature range which auto-adjusts to a five (5°F) degree dead band.
13. Shall have both a heat setpoint, cool setpoint, and auto-changeover.

14. Shall have Optimum Start algorithms that will calculate start times based on at least seven (7) days of previous run-time temperature and rate-of-change historical data for its space. Optimum Start algorithm shall recalculate each optimized schedule time before each optimized schedule.
 15. Shall be able to be manually overridden through BAS.
 16. Shall be configured through BAS.
- D. Wired Temperature Inputs are to be available to provide external temperature detection for specific BAS devices. Examples are to provide supply air temperature, water temperature, refrigeration temperature, outside air temperature, etc. to a thermostat or other device.
1. Shall accept 10K type II thermistors.
 2. Shall push to the BAS real-time temperature changes so as to be viewable historically and in real-time from the BAS.
 3. Shall accept a thermistor at a maximum of up to 100 feet from input terminal.
 4. Shall be configured through the BAS.
- E. Internet-Enabled Economizer Controller are controllers that modulate an outside air damper to provide ventilation and economization to a single zone.
1. Shall only require a dry-bulb outside air temperature sensor and dry-bulb supply air temperature sensor. No dry-bulb return air temperature sensor or dry-bulb mixing box temperature sensor shall be required to meet full economizer functionality to at a minimum California 2016 Title 24 standards.
 2. Shall communicate with thermostat to determine space temperature and space temperature setpoint in order to decide when economization can be used.
 3. Shall continue to economize as its only source of cooling as long as the outside air temperature is able to keep the space temperature within 1°F of the cool temperature setpoint.
 4. Shall be able to enable mechanical cooling at the same time as economization.
 5. Shall be able to prevent the supply air temperature from dropping below a minimum temperature.
 6. Shall provide enthalpy by use of pulling humidity and barometric pressure information from the Internet based on the zipcode of installation location.

Enthalpy shall not require any additional probes other than the dry-bulb probe and shall be free to enable.

7. If connected to a CO² thermostat, shall be able to provide demand ventilation control of outside air damper.
8. Shall have a minimum ventilation damper position and a maximum ventilation damper position.
9. Shall be able to be scheduled to not open the outside air damper for ventilation during unoccupied hours.
10. Shall be able to control a Variable Frequency Drive (VFD) with up to five (5) fan speed inputs. Example of fan speed changes are during ventilation, stage one cooling, stage two cooling, stage one heating, stage two heating.
11. Shall modulate an outside air damper by use of a 0-10VDC signal.
12. Shall accept a 0-10VDC signal feedback input from the outside air damper actuator to confirm outside air damper is working correctly.
13. Shall meet all California 2016 Title 24 codes, including Fault Detection and Diagnostic requirements.
14. Shall send Fault Detection and Diagnostic information to the BAS.
15. Shall accept a minimum of three (3) 10K type II thermistors.
16. Shall be able to modulate a 0-10VDC hot water, steam, or electric SCR for heating and outside air tempering.
17. Shall be able to modulate a 0-10VDC chilled water or modulating DX for cooling and outside air tempering.
18. Shall be able to control a face/bypass damper.
19. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from BAS. Examples are changes in equipment operation (heat, cool, fan, economization, ventilation), number of stages active, the supply air temperature, the return air temperature, hot water valve position, face/bypass damper position, variable speed fan setting, etc.
20. Shall be able to be manually overridden through the BAS.
21. Shall be configured through the BAS.

F. Internet-Enabled Power Relay Module are controllers which have dry-contact relays able to start/stop different electrical equipment. Examples are exhaust fans, lights, pumps, valves, boilers, chillers, etc.

1. Shall have relays with a max rating of 120 VAC @ 15 AMPs or 240/277 VAC @ 10 AMPs.
2. Shall have a low-voltage terminal for momentary contact override inputs. Override time shall be configurable for a specific amount of minutes through a configuration from the BAS.
3. Shall be able to provide Lead/Lag sequencing between relays.
4. Shall be able to accept an external dry-contact input used to verify flow if being used as a pump controller. If being used as a lead/lag pump controller, shall be able to alarm the BAS if flow is not detected when Pump A is enabled and start Pump B as a stand-by pump.
5. Shall communicate with the wireless mesh network through an external wireless antenna that runs on the 802.15.4 technical standards. Antenna shall be able to communicate with Power Relay Module over three (3) 18-gauge wires up to 500 feet between device terminal inputs.
6. Shall be able to automatically repeat the wireless mesh network to additional devices part of the BAS.
7. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are changes in relay positions On or Off.
8. Shall be able to be manually overridden through the BAS.
9. Shall be configured through the BAS.

G. Zone Controllers are controllers which operate equipment which supply heating, cooling and ventilation, or a combination of these mechanical states to multiple zones.

1. Shall communicate with the wireless mesh network through a removable wireless antenna that runs on the 802.15.4 technical standards.
2. Remote mountable antenna shall be able to communicate to Zone Controller over three (3) 18-gauge wires up to 500 feet between devices terminal inputs.
3. Communication from the Zone Controller to all zone/space Thermostats shall be over the wireless mesh network.

4. Shall be capable of providing 24VAC outputs which can be configured to provide control of the following: multiple stages of fan, multiple stages of cooling, and multiple stages of heating.
 5. Shall be capable of providing 0-10VDC outputs which can be configured to provide control of the following: variable speed fan (VFD), modulating outside air damper, modulating heating valve.
 6. Shall have integrated outside air damper control logic and not require a third-party or additional controllers to provide economization and ventilation control.
 7. Shall directly accept a supply duct static pressure probe. Shall have an integrated short-term and long-term learning PID loop algorithm for maintaining target supply static configurations. PID loop shall not require any type of cost for programming and is to be factory loaded into controller.
 8. Shall only require dry-bulb outside, return, and supply air temperature sensors.
 9. If communicating to CO² thermostat(s), shall be able to provide demand ventilation control of outside air damper.
 10. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are changes in equipment operation (heat, cool, fan, economization, ventilation), number of stages active, the supply air temperature, the return air temperature, the outside air temperature, hot water valve position, supply duct static reading, variable speed fan setting, etc.
 11. Shall be able to be manually overridden through the BAS.
 12. Shall be configured through the BAS.
- H. Make-up Air Controllers which operate equipment supplying ventilation to the building.
1. Shall communicate with the wireless mesh network through a removable wireless antenna that runs on the 802.15.4 technical standards.
 2. Remote mountable antenna shall be able to communicate to Controller over three (3) 18-gauge wires up to 500 feet between devices terminal inputs.
 3. Communication from the Controller to zone/space Thermostat(s) shall be over the wireless mesh network.

4. Shall be capable of providing 24VAC outputs which can be configured to provide control of the following: multiple stages of fan, multiple stages of cooling, and multiple stages of heating.
5. Shall be capable of providing 0-10VDC outputs which can be configured to provide control of the following: modulating variable speed fan (VFD), modulating outside air damper, modulating heating, modulating cooling.
6. Shall be able to modulate a VFD to maintain a targeted building static pressure.
7. Shall be able to modulate a 0-10VDC hot water, steam, or electric SCR for heating and outside air tempering.
8. Shall be able to modulate a 0-10VDC chilled water or modulating DX for cooling and outside air tempering.
9. Shall have integrated outside air damper control logic.
10. Shall directly accept a building pressure probe. Shall have an integrated short-term and long-term learning PID loop algorithm for maintaining target building pressure. PID loop shall not require any type of cost for programming, is to be factory loaded into controller, and updatable virtually through EMS.
11. Shall only require dry-bulb outside and supply air temperature sensors.
12. If communicating to CO² thermostat(s), shall be able to provide demand ventilation control of outside air damper.
13. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are changes in equipment operation (heat, cool, fan, economization, ventilation), number of stages active, the supply air temperature, the return air temperature, the outside air temperature, hot water valve position, supply duct static reading, variable speed fan setting, etc.
14. Shall be scheduled On or Off through the BAS.
15. Shall be able to be manually overridden through the BAS.
16. Shall be configured through the BAS.
- I. Wireless Proximity Sensors are thermostat accessories which are able to detect when a door or window is opened or closed, or be able to accept a dry-contact input from an occupancy sensor.
 1. Shall be able to communicate to a single Internet-Programmable Thermostat over wireless mesh network.

2. Shall communicate with the wireless mesh network through an internal wireless antenna that runs on the 802.15.4 technical standards.
 3. Shall run on two AA batteries and not require any unique type of battery to operate.
 4. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are if the door is open, if the space is unoccupied, if a window is open.
 5. Shall be configured through the BAS.
- J. Remote Wireless Sensors are thermostat accessories which are used to either average temperatures between the sensors location and a master thermostat or to relocate the sensing location of the master thermostat without having to run new wire.
1. Shall be able to communicate to a single Internet-Programmable Thermostat over wireless mesh network.
 2. Shall communicate with the wireless mesh network through an internal wireless antenna that runs on the 802.15.4 technical standards.
 3. Shall run on two AA batteries and not require any unique type of battery to operate.
 4. Shall push all "state changes" to the BAS as to be viewable historically and in real-time from the BAS. Examples are changes in equipment operation (heat, cool, fan), number of stages active, the temperatures in the space, temperature set-points, etc.
 5. Shall be configured through the BAS.
- K. Wireless Repeaters are devices which extend the 802.15.4 wireless mesh network across large expanses or where BAS devices are unable to repeat the wireless mesh network on their own. Examples are when bridging the wireless mesh network from one building to another.
1. Shall communicate with the wireless mesh network through an internal wireless antenna that runs on the 802.15.4 technical standards.
 2. Shall be able to automatically repeat the wireless mesh network to additional devices part of the BAS.
 3. Shall not require an Ethernet connection or any TCP/IP connection.
 4. Shall only require a single 120V outlet for power.

L. Configuration of Devices and System

1. To meet the sequence of operation for each controller, the controller shall be configured through the BAS by the installing contractor. No custom programming or downloading by use of a service tool shall be required.
2. Stand-Alone Operation: Each piece of equipment specified shall provide stand-alone operation. BAS devices shall not require web connection or communication to the BAS to run under normal operations.

PART 3 EXECUTION

3.0 EXAMINATION

- A. The Contract Documents shall be thoroughly examined for coordination of control devices, their installation, wiring, and commissioning. Coordinate and review mechanical equipment specifications, locations, and identify any discrepancies, conflicts, or omissions that shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- B. The BAS manufacturer shall be available to provide assistance to BAS Contractor in order to verify that control equipment can be installed as required, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.01 PROTECTION

- A. The BAS installing contractor shall protect all work and material from damage by their work or personnel, and shall be liable for all damage thus caused.
- B. The BAS installing contractor shall be responsible for their work and equipment until final inspection, testing, and acceptance. The BAS installing contractor shall protect their work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.
- C. Installation of BAS shall be performed by an approved Contractor. Approved contractor is one whom either has installed the BAS before or has been approved by the BAS manufacturer. The Contractor shall certify all work as proper and complete. Under no circumstance shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor unless that subcontractor meets the BAS approved Contractor requirements as stated above.
- D. Demolition. Remove controls which do not remain as part of the BAS. The owner will inform the Contractor of any equipment which is to be removed that will remain the property of the owner. All other equipment which is remove will be disposed of by the Contractor.

- E. Access to Site. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the owner or an owner-approved representative.
- F. Code Compliance. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.
- G. Clean Up. During installation, contractor shall maintain a clean environment. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

3.02 TEST AND BALANCE

- A. Testing of controls shall be performed by installing contractor. All equipment and their components being controlled shall be tested, including, but not limited too: heating enables and a proper supply air temperature from the AHU, RTU, and into the zone (if there is a zone box) is recorded, cooling enables and a proper supply air temperature from the AHU, RTU, and into the zone (if there is a zone box) is recorded, fan enables and the proper fan speed is set when specified (when using a multiple speed fan, VFD, or ECM motor), and that the outside air damper fully opens and closes when commanded. Any devices that are enabled and disabled shall properly respond to the BAS control signals.
- B. All control configurations shall be set to meet specifications. All temperatures and other sensors shall be determined accurate and configured for the type of temperature being detected.
- C. All mechanical systems controlled by BAS shall be properly balanced to the right CFMs to meet required codes and specifications.

3.03 WIRING, CONDUIT, AND CABLE

- D. All control wires between mechanical equipment and BAS devices are to be furnished and installed by others, unless BAS contractor is responsible for this part of the installation. The BAS contractor shall not begin work on this contract until all wiring is installed to the satisfaction of the BAS contractor.
- E. It is not an excuse to have not referenced the manufacturer's installation documentation or to have contacted the BAS manufacturer if wire installation is not understood and done incorrectly by the installing Contractor.

3.04 HARDWARE INSTALLATION

- A. Installation Practices for Devices. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.

B. It is not an excuse to have not referenced the manufacturer's installation documentation or to have contacted the BAS manufacturer if hardware installation not understood and done incorrectly by the installing Contractor.

C. Identification.

1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
2. All field enclosures, other than controllers, shall be identified with a nameplate. The lettering shall be in white against a black or blue background.
3. Junction box covers will be marked to indicate that they are a part of the BAS.
4. All field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
5. All field devices inside FIP's shall be labeled.

D. Existing Controls. Existing controls are not to be reused. All BAS devices will be new.

E. Control System Switch-Over. The installing contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on-site so that the entire switch-over can be accomplished in a reasonable time frame.

F. Location.

1. The location of sensors is as indicated in the mechanical and architectural drawings.
2. Space temperature, humidity, and CO² sensors will be mounted away from machinery generating heat, direct light, and/or diffuser air streams.
3. If external temperature sensors are installed, sensors will be mounted away from machinery generating heat, direct light, and/or diffuser air streams.
4. If outdoor air temperature sensors are installed, sensors are to be installed such that the effects of heat radiated from the building or sunlight is minimized.

3.05 SYSTEM CONFIGURATION

A. General. The installing contractor shall provide all labor necessary to install, initialize, start-up and troubleshoot all system hardware and configurations described in this section. This includes any requirements necessary to access the web application on third-party devices.

- B. Installing contractor shall work with owner's representative to determine configuration parameters including but not limited to hours of operation, set points, system variables, naming of devices, and site naming. Naming of devices and the site shall be performed by the installing contractor. Naming convention of space thermostats shall be space served. Naming convention of zone controllers shall be the equipment serial number. All naming shall be provided by or agreed upon with the owner.

3.06 SYSTEM COMMISSIONING AND SYSTEM STARTUP

- A. Each BAS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Documentation shall be provided to the owner that proves installation and testing has been completed and points out any mechanical issues found that are not related to the installation of the BAS. Successful completion of the system tests shall constitute the beginning of the warranty period.
- B. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to BAS.
- C. Upon completion of installation, submit three (3) copies of record documents. The documents shall be submitted for approval prior to final completion and include:
 - 1. Testing and Commissioning Reports and Checklists signed off by trained field commissioning personnel.
 - 2. Name, address and telephone number of Contractor personnel managing and installing equipment, along with service personnel responsible for supporting the ongoing warranty and services of the control system.
 - 3. Procedures for operating the BAS including logging on/off, alarm management, reading reports, trends, modification of setpoints, scheduling, and other interactive system requirements.
 - 4. Provide information on how to receive support from Pelican Wireless Systems and demonstrate that they are a direct supporting resource. Contact information for Technical Support from Pelican Wireless Systems is to be provided.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes: Provide ductwork and appurtenances required for a complete air transmission and distribution system for the heating, ventilating, and air conditioning systems indicated on Drawings and as specified.
- C. Related Sections:
 - 1. Section 09900: Paints and Coatings.
 - 2. Section 15010: Basic Mechanical Requirements.
 - 3. Section 15050: Basic Mechanical Materials and Methods.
 - 4. Section 15070: Mechanical Sound, Vibration and Seismic Control.
 - 5. Section 15080: Mechanical Insulation.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 15010: Basic Mechanical Requirements.
- B. Manufacturer's Data:
 - 1. Complete list of items to be furnished and installed under this section. Material lists that do not require performance data shall include manufacturer names, types and model numbers.
 - 2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.
 - 3. Literature shall include descriptions of equipment, types, models, sizes, capacity tables or curves marked to indicate performance characteristics, electrical requirements, options selected, space requirements (including allowances for servicing) and other data necessary to ensure compliance with requirements of these Specifications and performances indicated on Drawings. Data shall also include name and address of nearest service and maintenance organization that regularly stocks repair parts. Listings of items that

function as parts of an integrated system shall be furnished at one time.

4. Shop Drawings: Shop Drawings indicating methods of installation of equipment and materials, sizes and gages of ducts, and details of supports. Items to be covered shall include but not be limited to following:
 - a. Layout of ductwork and equipment drawn to scale to establish that equipment will fit into allotted spaces with clearance for installation and maintenance. Indicate proposed details for attachment, anchoring to, and hanging from structural framing of building. Indicate vibration isolation units, foundations, supports, and openings for passage of pipes and ducts
 - b. Drawings indicating locations and sizes of sleeves and prepared openings for pipes and ducts.
 - c. Typical details of supports for equipment and ductwork.

1.03 QUALITY ASSURANCE

- A. Installer's and Manufacturer's Qualifications: Comply with provisions stated under Section 15010: Basic Mechanical Requirements.

1.04 PRODUCT HANDLING

- A. Protection, Replacements, Delivery and Storage: Comply with provisions stated in Section 15010: Basic Mechanical Requirements.

1.05 COORDINATION

- A. Coordinate activities in accordance with provisions of Section 15010: Basic Mechanical Requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Unless otherwise noted, provisions, including amendments thereto, of the HVAC Duct Construction Standards of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) and the California Mechanical Code (CMC), are hereby made part of this section.
- B. Rectangular, round and flat oval ducts shall be manufactured and installed in accordance with requirements of the HVAC Duct Construction Standards of SMACNA.

- C. Sheet metal ducts shall be fabricated from galvanized steel, aluminum or stainless steel.
- D. Galvanized steel ducts shall be fabricated of galvanized steel sheet, lock forming grade, conforming to ASTM A 525 and A 527.
- E. Galvanized steel ducts gage thickness and permissible joints and seams shall conform to requirements in Table 2, Minimum Metal Gages, of this section.
- F. Ducts shall be reinforced in accordance with SMACNA standards.
 - 1. Cross-broken Duct: Duct sizes 19 inches wide and larger which have more than 10 square feet of unbraced panel shall be beaded or cross-broken. This requirement is applicable to 20 gage or less thickness and 3 inches w.g. or less pressure. For details, refer to SMACNA manual.
- G. Round, Oval and Flexible Duct for Galvanized Steel:
 - 1. Round Spiral Ducts and Fittings: Fabricated from galvanized sheet steel shall be machine-formed spiral pipe with sealed spiral locking joints. Fittings shall be furnished with continuous corrosion-resistant welds. Ducts and fittings shall be as manufactured by United Sheet Metal, or equal. Provide gages of ducts and fittings recommended by manufacturer.
 - 2. Details of seams and transverse joints for round duct and fittings shall conform to SMACNA standards.
 - 3. Flat oval ducts shall be provided as indicated on the Drawings. Reference standard details in SMACNA manual.
 - 4. Minimum duct wall thickness for flat oval duct construction shall be as indicated in SMACNA manual.
 - 5. Non-metallic flexible duct for T-bar suspended ceiling may be provided upon review of the Architect, after submittal of installation, bench details and certified test data in accordance with the Air Diffusion Council Test Code FD-72. Flexible duct shall be rated for not less than 6 inches w.g. static pressure.
 - 6. Flexible duct shall be non-metallic, insulated for conditioned air supply and return. The flexible ducts shall be factory fabricated with exterior reinforced laminated vapor barrier, 1-1/2 inch thick fiber glass insulation ($K=0.25$ @ 75 degrees F.), encapsulated zinc-coated spring steel wire helix and impervious, smooth, non-perforated interior vinyl liner and factory fabricated steel connection collars. For the composite assembly, including insulation and vapor barrier,

comply with NFPA Standard 90 A or 90 B and tested in accordance with UL Standard, UL-181. Non-insulated metallic ducts shall be provided for exhaust only.

7. Methods of installations, standards for joining and attaching, and supporting flexible duct shall conform to applicable provisions of SMACNA manual.
 8. These provisions apply for ducts furnished for indoor comfort heating, ventilating and air conditioning service only.
 9. Specifications herein shall not supersede installation requirements by flexible duct manufacturer if those are more stringent.
- H. Fittings and Other Construction Details: Details of fittings such as elbows, turning vanes, branch take-off and connections, duct access doors, connections for grilles, registers and ceiling diffusers, flexible connector at fan, etc., shall conform to applicable provisions of this section or SMACNA manual.
- I. Duct Seam and Joint Sealant: Furnish duct seam and joint sealant or tape for metal ducts. Sealant for low-pressure ducts shall be 3M Company Miracle D17, or equal, for installation with a caulking gun. Provide tape joints with canvas with Borden Chemical Division Arabol adhesive, or equal. Provide sealing material for medium-pressure ducts as described in the SMACNA manual for those pressures.
- J. Restrictions:
1. Zinc-coated steel duct shall not be installed for ductwork transporting moisture-laden air. Aluminum shall not be installed for kitchen cooking equipment ductwork. Fume hood exhaust shall be stainless steel, non-metallic, or coated metal as required. Flexible duct may only be furnished where specifically indicated on Drawings. Aluminum ducts shall not be installed for internal pressures above 2 inches of water.
 2. Fiberglass duct is not permitted as a substitute for sheet metal duct.

2.03 ACOUSTICAL DUCT AND PLENUM LINERS

- A. Duct liners shall conform to requirements of Section 15080: Mechanical Insulation.

2.04 DAMPERS

- A. Manually Operated Volume Control Dampers:

1. VD-1, Rectangular: Multi-blade type, opposed blade operation, 16 gage galvanized steel blades; center pivoted on 3/8 inch diameter steel trunnions; interlocking edges; dampers shall be in own angle frame, full duct size as indicated on Drawings; frame of minimum 16 gage steel channel construction. Provide with damper operator and axles positively locked to blade. Ruskin MD 35, or equal.
2. VD-2, Round: Frame shall be constructed of not less than 16 gage galvanized steel, blades of not less than 16 gage galvanized steel channel construction with factory neoprene seals, 1/2 inch diameter axle shafts and locking hand quadrant. Ruskin CDR S25, or equal.
3. VD-3, Oval: Frame shall be constructed of not less than 14 gage galvanized steel channels with factory blade seals of not less than 12 gage galvanized steel with not less than 1/2 inch diameter axle shafts. Provide Ruskin standard construction for frame, blade and axle size, thickness and material variation. Provide adjustable locking hand quadrant. Ruskin CDO 25, or equal.

B. Motorized Volume Control Dampers:

1. MVD-1, Rectangular: Multi-blade type opposed blade operation, 16-gage minimum steel channel frame construction; 16-gage galvanized steel blades center pivoted on 1/2 inch diameter steel trunnions. Interlocking edges. Dampers shall be in own angle frame. Full duct size as indicated on the Drawings. Provide with matching 2-position motorized actuator with linkages, 120 VAC by Barber-Colman, Honeywell, or equal. Ruskin, Damer CD35, or Pottorff.
2. MVD-2, Round: Butterfly type constructed with minimum 18 gage galvanized steel frame with steel angle reinforcement on above 20 inches diameter. Blade 2-layer, minimum 14-gage equivalent thickness. Neoprene seal to ensure air tightness in closed position. Furnish with matching 2-position motorized actuator with linkage 120 VAC by Barber-Colman, Honeywell, or equal.

C. Relief Dampers: Parallel multi-blade type. Constructed of 20 gage galvanized sheet steel or aluminum alloy with solid stops all around. Bearings shall be self-lubricated type. Damper shall open on a positive pressure within space and close to a backdraft. Interlocking edges shall prevent dust infiltration when closed. Air Balance, Pottorff, Ruskin or Metal Form.

D. Duct Access Panels: Provide factory fabricated access panels in ducts where required for servicing fire or smoke dampers, and at other locations as specified in this section. Units shall consist of removable panel, gasketed and pressure sealed by controlled spring tension locks. Construct unit, including interior parts, of same material as duct. Units shall be constructed

to be suitable for installation in systems of up to 5 inches water gauge static pressure.

2.05 AIR DISTRIBUTION DEVICES

A. General:

1. Grilles, registers, diffusers and appurtenances shall conform to requirements specified herein and shall be of type and sizes as specified and indicated on Drawings. Performance shall be in accordance with Air Diffusion Council Test Code 1602R2 including airflow velocity, pressure, temperature, and sound measurements.
2. Sponge neoprene, rubber, vinyl or felt border gaskets shall be provided for surface-mounted registers, grilles or diffusers.
3. Maximum sound level for supply diffusers and return and exhaust grilles shall not exceed NC 35.
4. Ceiling diffusers shall be provided with equalizing deflectors. Barber-Colman Deflectrol, Anemostat Model ED, Tuttle, or Bailey M-6.
5. Ceiling mounted grilles, registers and diffusers shall be provided with a factory applied, baked enamel, dull finish, bone white to match acoustical ceiling tile.
6. Grilles or registers mounted on painted walls or other surfaces shall be furnished with a baked prime coat and finish painted in accordance with Section 09900: Paints and Coatings.
7. Ceiling diffusers return grilles with duct connections, and exhaust grilles shall be provided with loose key-operated opposed blade volume control. Volume controls for return grilles without duct connections are not required.

B. Ceiling Diffusers - Round, Square, Rectangular:

1. CD-1, Acoustical Tile on Plaster Ceilings or Exposed Ceilings: Units shall be square or rectangular modular core type flush and flanged for surface mounting. Anemostat Type RMD-S, or equal.
2. CD-2, Prefabricated Acoustical Tile Ceilings with Inverted Exposed T-Bars: Units shall be square or rectangular modular core lay-in, flush panel type with a nominal overall dimension of 24 inches x 24 inches. Anemostat Type RMD-FP, or equal.
3. CD-3: Units shall be round, adjustable pattern, surface-mounted type. Anemostat Type C-27, or equal.

C. Grilles - Return, Exhaust, Ceiling, Square, Rectangular:

1. GR-1, Acoustical Tile on Plaster Ceiling: Return and exhaust grilles shall be single deflection type with horizontal fixed face bars set at straight or 45 degree angle and flush and flanged for surface mounting. Anemostat Type S3HD, or equal.
2. GR-2, Prefabricated Acoustical Tile Ceiling with Inverted Exposed T-Bars: Return and exhaust grilles shall be with single deflection horizontal fixed face bars, set at straight or 45 degree angle flush, lay-in panel type with nominal overall dimension of 24 inches x 24 inches. Anemostat Type SAC3LD, or equal.

D. Registers, Supply, Return, Wall:

1. WR-1: Sidewall supply register shall be double deflecting type with loose key-operated opposed blade volume control. Anemostat Type S2HO, or equal.
2. WR-2: Sidewall return register shall be single deflecting type with horizontal fixed face bars set at 45 degree angle flush and flanged for surface mounting and complete with loose key-operated opposed blade volume control. Anemostat Type S3HOD, or equal.

2.06 SMOKE DETECTORS

- A. Refer to Division 16: Fire Alarm Systems

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 DUCTWORK

- A. Construct ductwork according to details of fabrication and methods of support, as indicated in the SMACNA manuals and CMC, unless specified or indicated otherwise in this section or on Drawings. In event of conflict, the most stringent requirement shall be provided.
- B. Unless otherwise required, construct ducts to conform accurately to dimensions indicated and to be straight and smooth on inside, with joints neatly finished.

- C. Duct dimensions indicated are net inside dimensions. If the indicated duct is to be furnished with an acoustic lining, add twice the thickness of the acoustic liner in both the duct width and height dimensions to provide the gross sheet metal duct dimensions.
- D. Where aluminum is welded, provide aluminum with thickness of minimum 16 gage, and metallic arc or acetylene process of welding.
- E. Anchor ducts to building structural slab, framing and roof decking and detail method of anchoring and fastening if not indicated on Drawings. Supports shall be seismically constructed.
- F. Construct and install ducts to be completely free from vibration under operating conditions.
- G. Indicate on layout drawing, required for suspended ductwork, location of supports, loads imposed on each fastening or anchor, typical details for anchorage, and details for special anchorage for supports attached to metal roof decking.
- H. Attach supports only to building structural framing members and concrete slabs.
- I. Where supports are required between structural framing members, detail and install suitable intermediate metal framing.
- J. Ducts transporting air-conditioned or heated supply air shall be insulated in accordance with requirements of Section 15080: Mechanical Insulation.
 - 1. Ducts exposed to weather shall be furnished with exterior insulation with weather jacket and interior lining as indicated on Table 2, Section 15080: Mechanical Insulation.
- K. Ferrous angles and structural members and joining collars specified for construction and support of ductwork and plenums shall be primed with one heavy coat of required asphaltic aluminum paint before installation or fabrication. Metal surfaces shall be thoroughly cleaned before installation of paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls are not required to be primed or painted.
- L. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.

3.03 DUCT CONSTRUCTION

- A. Minimum ductwork gages, joints, reinforcing, and bracing shall conform to the following tables. Hoods, plenums, and castings shall not be lighter than

the duct gage listed in Table 2 for corresponding dimensions. Additional bracing shall be provided to prevent objectionable panel vibration.

- B. Provide longitudinal seams of the grooved snap lock and standing, sealed and taped, or sealed spiral or continuously welded. For exhaust duct, taping may be omitted.

TABLE 1 - SHEET METAL THICKNESS FOR CIRCULAR DUCTS AND FLAT-OVAL

(FOR STATIC PRESSURES LISTED)

Joints	Gage Thickness		Diameter of Duct		Horizontal Girth	
	2" Water Column					
	Maximum S.P.		Maximum		Maximum	
	Round / Oval		Diameter Support		Distance	
	26 / 24	Up to 9"	10'	2"slip		
	26 / 24	9" - 14"	8'	4"		
	24 / 22	14" - 23"	8'	4"		
	22 / 20	23" - 37"	8'	4"		
	20 / 18	37" - 51"	6'	1¼" x 1⅛" flange		

- C. Construction Details for Rectangular Sheet Metal Ducts for Low-Pressure Systems - Velocities not Exceeding 2,000 Feet Per Minute:

- For pressures in excess of 2 inches water column, duct wall thickness shall be 2 gages heavier than set forth in this table.
- Duct specifications shown below are applicable when ducts larger than 18 inches are cross-broken. Where cross breaking is not provided, duct wall thickness shall be 2 gages heavier on ducts 19 inches to 60 inches wide unless longitudinal standing seams are furnished.

TABLE 2 - MINIMUM METAL GAGES

Minimum Gage	Max. Side,	Duct Permissible Girth	Horizontal
Thickness	Gross	Joints & Longitudinal	Support
			Maximum

Steel / Aluminum	Dimensions	Seams	Distance
26 / 24	Up to 12"	Drive-slip, plain S-slip, or 1" pocket lock	10'
24 / 22	13" - 18"	Drive-slip, plain S-slip, 1" pocket lock	10'
Minimum Gage	Max. Side,	Duct Permissible Girth	Horizontal Support
Thickness	Gross	Joints & Longitudinal	Maximum
Steel / Aluminum	Dimensions	Seams	Distance
24 / 22	19" - 30"	Hemmed S-slip, 1" bar slip, or 1" pocket lock on 5' centers. Hemmed S-slip, 1" slip, or 1" pocket lock on 5' centers with 1" x 1" x 1/8" angles on center line between. Hemmed S-slip, 1" bar slip, or 1" pocket lock on 10' centers with cross break 1" standing seam on 5' centers.	10'
22 / 20	31" - 42"	1" bar slip, reinforced bar slip, or pocket lock 5' centers. 1" bar slip, reinforced bar slip, or pocket lock on 10' centers with 1" x 1" x 1/8" angles on center line between.	8'

1" standing seam on 5' centers
inside longitudinal standing seams
with 1"x 1" x 1/8" angles on 5'
centers on exterior.

22 / 20	43" - 54"	1-1/2" bar slip, reinforced bar slip, 8' or pocket lock on 4' centers. 1-1/2" bar slip, reinforced bar slip, 8' or pocket lock on 8' centers with 1-1/2" x 1-1/2" x 1/8" angles on center line between. 1-1/2" bar slip, reinforced bar slip, or pocket lock on 4' centers with cross break.
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Minimum Gage	Max. Side,	Duct Permissible Girth	Horizontal Support
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Thickness Maximum	Gross	Joints & Longitudinal
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<u>Steel / Aluminum</u>	<u>Dimensions</u>	<u>Seams</u>	<u>Distance</u>
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20*/ 18 8'	55" - 60"	1-1/2" standing seam on 3' centers inside longitudinal standing seam with 1-1/2" x 1-1/2" x 1/8" angles on 4" centers on exterior.
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20*/ 18	61" - 84"	Reinforced bar slip, angle slip, 6' alternate bar slip, or angle reinforced pocket lock on 4' centers using 1-1/2" x 1-1/2"
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1/8" 1-1/2" x 1/8" angles on
centerline between reinforced
bar slip, angle slip, alternate
bar slip or angle reinforced
pocket lock on 8' centers using
1-1/2" x 1-1/2" x 1/8" reinforcing
angles 2' on centers in-between 1-1/2"
angle reinforced standing seam on
2' center using 1-1/2" x 1-1/2" x
1/8" reinforcing angles. Inside
longitudinal standing seams with
1-1/2" x 1-1/2" 1/8" angles on
2' centers on exterior.

* Button punch snap-lock seams, Lockformer, or equal, shall only be permitted on 20 and 22 gage galvanized steel ducts. For aluminum duct, button punch snap-lock is not permitted.

- D. Ferrous angles and structural members and joining collars specified for the construction and support of ductwork and plenums shall be primed with one heavy coat of asphalt aluminum paint before installation or fabrication. The metal surface shall be thoroughly cleaned before application of the paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls is not required to be primed or painted.
- E. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.
- F. S-type or drive-slip type girths or longitudinal seams shall not be furnished for ductwork installed outdoors or mounted on roofs. Provide angle-reinforced government lock only.
- G. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint, Devcon Z or ZRC cold galvanizing compound.

3.04 DUCTS AND PLENUMS WITH LINERS

- A. Ducts and plenums lined with acoustical insulation shall be as indicated on Drawings.
- B. Duct dimensions indicated on Drawings are net. Add thickness of acoustic liners to obtain gross sheet metal duct dimensions.
- C. For duct liner Specifications and installation, refer to Section 15080: Mechanical Insulation.

3.05 DUCT ELBOWS AND TURNING VANES

- A. Duct elbows, including supply, exhaust, and return, shall be provided with a centerline radius of 1.5 times duct width parallel to radius whenever possible; centerline radius shall not be less than width of duct parallel to radius.
- B. Where space does not permit above radius, or where square elbows are indicated on Drawings, turning vanes shall be installed whether indicated on Drawings or not.
- C. Turning vanes shall be thick double-wall vane type, Titus Y or Z, Tuttle and Bailey, or equal. Duro-Dyne vane rail system duct turns may be furnished, provided they are of thick double wall type and Shop Drawings are submitted and reviewed by the Architect. Duct turning vanes shall be of same material as ductwork and shall be rigidly fastened in ductwork.

3.06 DUCT JOINTS AND SEAMS

- A. Conditioned air supply ducts shall be furnished with joints and seams taped for air tightness or welded, except spiral seam factory machine formed duct components. Spiral seam is exempted. Joints between slip-fit components may be assembled with all seams and joint connections fastened with screws and taped.
- B. Other ducts shall be furnished with joints and seams sealed by caulking, taping, soldering, or welding. Ducts for grease hood exhaust shall be furnished with grease-tight welding or brazing on external surface for joints and seams. Fiberglass ducts shall be provided with a thermally activated closure system, Johns Manville Fortifiber Therm-Lock with Automatic Bond Indicator dots, or equal.
- C. S-slip or drive-slip type girths or longitudinal seams are not permitted on exterior or exposed rooftop mounted ductwork. Provide angle-reinforced government lock only.
- D. Caulking, taping, or other joint or seam treatment shall be provided in accordance with recognized standards.

- E. Unless otherwise detailed, taping shall be with Duro-Dyne FT-2, 2-inch wide tape, installed over S-2 duct sealer or Arabol and canvas tape or listed Miracle tape. Ducts shall not be covered or insulated on outside until joints are inspected by the PI. A second coat of Arabol or adhesive shall be installed 24 hours after initial application if separation occurs. Provide only approved and UL or Factory Mutual listed material for sealing and caulking.
- F. Seams around fan, coil housing and plenums shall be sealed with gaskets or caulking compound to provide an airtight assembly.
- G. Ductwork connected to range hoods shall be provided with grease-tight seams, and shall be constructed and installed so that grease or other material cannot become pocketed in any portion thereof, and system shall slope downward toward hood not less than 1/4 inch per lineal foot. Joint caulking or sealing compound shall be as required by DSA.
- H. Duro-Dyne S-2, or equal, as recommended and guaranteed by manufacturer for this specific application, shall be installed in accordance with manufacturer's recommendations. Metal surfaces shall be thoroughly cleaned before installing caulking compound. Galvanized surfaces shall be etched, if necessary, to obtain a bond between metal and caulking compound.

3.07 DUCT TRANSITION

- A. Slopes in sides of transition pieces shall be no greater than 1 to 5. Abrupt changes or offsets in duct system are not permitted, except when reviewed by the Architect.

3.08 DUCT TEST HOLES

- A. Holes in ducts and plenums shall be provided for pilot or static tubes for obtaining air measurements to balance or check air systems. Holes shall be covered with neoprene gasketed sheet metal cover or plugged with a fitted neoprene plug chained to duct.

3.09 SOUND ATTENUATING EQUIPMENT

- A. Install sound attenuators where required and indicated on Drawings. Refer to manufacturer's instructions for required installation.

3.10 FLEXIBLE CONNECTIONS

- A. At points where sheet metal connections are installed to fans or air handling units, or where ducts of dissimilar metals are connected, a flexible connection of commercial grade, Duralon by Duro-Dyne Corporation, or equal, non-combustible material shall be installed and securely fastened by zinc-coated steel clinch-type bands or a flange type connection. Inlet and outlet openings shall be axially in-line, maximum deviation of centerline

shall be less than 5 percent of diameter or shortest dimension of a rectangular inlet of fan or air handling unit, with system at rest. Duct end of connection shall be seismically restrained if more than 4 feet from last support.

3.11 AIR TERMINAL DEVICES

A. General:

1. Install supply devices after ducts, plenums, and casings have been cleaned and blown free of small particles, as specified. Devices shall be aligned to be parallel to ceiling construction or walls and ceiling surfaces and shall be pulled tightly to compress gaskets and to fit neatly against surfaces.

- #### B. Diffusers:
- Support surface mounted ceiling diffusers from angles or channels resting on and fastened to ceiling construction. Do not support from ducts. Install lay-in diffusers on T-bar ceilings supported by ceiling structure. Provide sheet metal adaptor box above each diffuser to allow space for volume controller with round collars for connection to round ducts where indicated on Drawings. Fasten duct-mounted diffusers to duct collars.

C. Registers and Grilles:

1. Install wall supply registers at least 6 inches below ceiling, unless otherwise indicated. Locate return and exhaust registers 6 inches below ceiling unless otherwise indicated.
2. Support ceiling diffuser type inlets, registers, and grilles as required above for ceiling diffusers.
3. Fasten wall mounted and duct mounted registers and grilles to flanges of duct collars.

3.12 DAMPERS

- #### A. Manually operated dampers, gravity dampers, fire dampers, and motor operated dampers shall be furnished and installed as specified and indicated. Upon completion of installation, dampers shall be checked, lubricated, and adjusted so that they operate freely, without binding. Dampers shall be of standard commercial manufacture, complete with damper frame. Where painting is required, they shall be shop finished unless otherwise noted.

1. Balancing dampers shall be installed in main supply ducts from fan discharge plenums, where 2 or more ducts are connected to each plenum, although such balancing dampers may not be indicated. Each zone shall be provided with a manual volume damper. Sheet

metal screws shall be installed through handles and into ducts to lock damper in place after test and balance.

2. Supply, return, and exhaust branches shall be provided with manual volume dampers.
3. Dampers installed in accessible locations shall be provided with locking and indicating quadrants. Ventlock, Duro-Dyne, or equal.
4. Dampers installed in ductwork in furred ceiling spaces or in roof spaces with less than 30 inches of clearance below beams, joists, or other construction, and where access panels are not provided shall be furnished with damper rods extended below ceiling and terminated with a concealed damper regulation. Ventlock, Young, or equal.
5. Dampers not identified as splitter, extractor, or butterfly dampers shall be of multi-louver type arranged for opposed blade operation. Damper shall be same dimension as adjoining duct and be tight closing. Blades shall be not greater than 4 inches. Dampers shall be not less than 20 gage steel. Teflon, or equal.
6. Motor operated dampers shall be furnished by temperature control manufacturer as part of temperature control equipment and shall conform to requirements of Section 15975: Direct Digital Control System.
7. Dampers shall be provided with accessible operating mechanisms. Where operators are exposed in finished portions of building, operators shall be chromium-plated with exposed edges rounded. Splitter dampers are not permitted unless specified and reviewed by the Architect.
8. Dampers shall not be installed in combustion air ducts.
9. Access panels shall be installed for access at each damper's operating mechanism.

3.13 BACKDRAFT DAMPERS

- A. Backdraft dampers shall be installed at locations indicated in accordance with the State of California Energy Conservation Standards, Title 24, CCR.

3.14 DUCT SLEEVES AND PREPARED OPENINGS

- A. Furnish duct sleeves for 15-inch diameter ducts or less passing through floors, walls, ceilings, or roof and install during construction of the floor, wall, ceiling, or roof. Install round ducts larger than 15 inches diameter and square and rectangular ducts passing through floors, walls, ceilings or roof

through prepared openings. Provide duct sleeves and prepared openings for duct mains and duct branches.

- B. Provide one inch clearance between duct and sleeve or between insulation and sleeves for insulated ducts, except at grilles, registers and diffusers.
- C. Provide prepared openings for round ducts larger than 15 inches in diameter and for square and rectangular ducts with one inch clearance between duct and openings or between insulation and opening for insulated ducts, except at grilles, registers and diffusers.
- D. Provide closure collar of galvanized sheet metal not less than 4 inches wide unless otherwise indicated on Drawings on each side of walls or floors where sleeves or prepared openings are provided except where grilles or diffusers are installed. Install collar tight against surface. Fit sharp edges of collar installed around insulated duct to preclude tearing or puncturing insulation covering vapor barrier. Fabricate collars from round ducts in steel. Provide not less than 4 nails to attach collar where openings are 12 inches in diameter or less and not less than 8 nails where openings are 20 inches in diameter or less.
- E. Pack space between sleeve or opening and duct or duct insulation with commercial grade packing yarn.

3.15 FLEXIBLE DUCT RUNOUTS

- A. Runouts from branches, risers or mains to air terminal units and outlets may be pre-insulated, factory fabricated flexible ducts complying with NFPA No. 90A. Flexible ductwork shall not exceed 7 feet in length. When required to suspend flexible ducts, furnish hangers of type recommended by manufacturers of pre-insulated flexible duct and install at intervals recommended. Method of attachment to other components of air distribution system for a vapor-tight joint shall be in accordance with printed instructions of flexible duct manufacturer. Bend radius shall be 1-1/2 times diameter of duct, measured from centerline. Bends greater than 90-degree angle are not permitted. Non-metallic flexible duct shall be permitted only in T-bar suspended ceilings.

3.16 DUCT HANGERS AND SUPPORTS

- A. Single horizontal ducts shall be suspended from heavy steel hanger straps securely fastened to overhead structural members. Ducts shall be supported by a hanger strap passing around and fastened to duct with not less than 2 Parker No. 10 screws set approximately 2 inches in from each edge, to form a supporting stirrup attached to overhead supports. Rectangular ducts shall be provided with 2 hanger straps, one located on each side of duct. Round ducts may be installed from a single hanger strap

unless conditions require that duct be held tight against ceiling, in which case 2 hanger straps may be brought down each side of duct, oriented at right angles to axis of duct and securely fastened to duct standing leg seam or angle iron stiffener with a minimum of 2 bolts, measuring 1/4 inch, for each side of duct. Hanger straps shall be galvanized with a minimum size of 1-1/8 inches x 14 gage. Angles of galvanized steel of 1-1/8 inches x 1-1/8 inches x 16 gage (14 gage for ducts 60 inches or greater) may be furnished instead of straps.

- B. Where ducts are installed one above the other, they shall be individually supported on a trapeze of steel angles with 3/8 inch supporting steel rods securely fastened to overhead construction. A minimum distance of 3 inches shall be maintained between ducts wherever possible, but in no event shall distance be less than 2 inches. Minimum sizes of steel angles shall be 1-1/2 inches x 1-1/2 inches x 1/8 inch for duct sizes through 60 inches in greatest dimension, 2 inches x 2 inches x 1/8 inch for duct sizes 61 inches through 84 inches, 2 inches x 2 inches x 3/16 inch for duct sizes 85 inches through 96 inches, and 2 inches x 2 inches x 1/4 inch for duct sizes over 97 inches
- C. Ducts 30 inches square area and greater and ducts 20 feet long and longer shall be seismically restrained. Refer to Section 15070: Mechanical Sound, Vibration and Seismic Control.
- D. Hangers shall not be supported by, or fastened to, non-structural members including blocking. Toggle or Molly type bolts are not permitted.
- E. Vertical ducts shall be supported with suitable angles on each side of each duct located at each floor and at intervals not to exceed 8 feet. Angles shall be sized for required span so that they will be rigid, without bending or sagging.
- F. Roof-mounted ductwork shall be installed a minimum 12 inches above roof and shall be supported by galvanized welded pipe, one on each side, and fastened to roof in pitch pan filled cold process cement. Install supports at each turn, unit connections, and each penetration, and space at maximum 6 feet off-center in general.

3.17 ACCESS PLATES AND DOORS

- A. Access plates and doors shall be furnished and installed where stops, valves, fire dampers, fusible links, coils, damper operating mechanism, control equipment, lubrication fittings, air filters, air handling equipment and similar items normally requiring adjustment or servicing are installed in concealed spaces.
- B. Access plates and doors shall be located to permit convenient access to equipment sized to permit removal of equipment for servicing. Access

plates shall be no less than 12 inches x 12 inches in clear opening. Proper servicing of equipment requires adequate access for maintenance personnel. Access doors shall not be less than 24 inches x 24 inches, unless otherwise detailed. Two or more valves shall not be located in same access area unless sufficient clearance is provided for operation, servicing and removal of each valve.

- C. Openings in ducts or plenums whose longer dimension does not exceed 12 inches may be covered by a plate of same material as duct, gasketed and fastened to duct or plenum with sheet metal screws.
- D. Access plates in floors shall not be less than 8 inches x 8 inches and shall be carborundum surface brass with cast brass frames anchored into concrete. Access plates in tile walls shall be chromium plated brass and polished. Approved serrated plates furnished as part of a clean-out assembly are permitted in floors instead of a separate plate.
- E. Access plates and doors in walls and ceilings of finished rooms and in locations normally accessible to students shall be furnished with continuous piano hinges, unless otherwise specified, and a special flush type spring-loaded latch requiring an Allen wrench to operate. Access devices shall be installed after plastering in plaster ground openings.
- F. Access panels or doors penetrating one-hour fire resistive ceilings shall meet code requirements for such openings.
- G. Access panels shall be fire rated Milcor manufactured by Inland Steel Products Co., or equal. Access doors shall be as required for installation in openings penetrating one-hour fire resistive ceilings. Access doors shall be furnished with a flush, key-operated cylinder lock, furnished with 2 keys each, instead of Allen headlock for non-rated ceilings.
- H. Access panels that are part of an integrated ceiling are specified in Section 09511: Acoustical Ceilings. Identification markers shall be affixed to adjacent supports, under this portion of Work, to indicate location and type of mechanical device to be serviced.
- I. Access panels installed in ducts or plenums located in heater or equipment rooms containing gas-fired equipment shall be furnished with heavy-duty spring closing hinges and refrigerator door type catches unless otherwise required. When these panels are intended for maintenance personnel access, catches shall be operable from both interior and exterior.
- J. Other access panels, except those specified above, shall be furnished with suitable hinges and one or more sash fasteners.
- K. Panels located in ducts and plenums shall be installed with gaskets made of synthetic rubber, felt, or similar material to provide an airtight installation. Panels shall be constructed and reinforced to prevent vibration.

- L. Letter words "FIRE DAMPERS" on panels over fire dampers and words "DO NOT OPEN - HEATER IS OPERATING" on panels located in heater or equipment rooms. Letters shall be approximately 3 inches high, if space is available.
- M. Furnish a key to operate latch access plates, one for each access plate, but not to exceed 5 keys for any one Project.
- N. Access plates and panels shall be furnished with manufacturer's name or trade mark and model number cast or stamped thereon, or upon a label permanently affixed thereon.
- O. Provide duct through roof flashing as detailed in the SMACNA standards or as indicated on Drawings.
- P. Refer to SMACNA Figures 2-12 and 2-13 for access plate and door construction.

3.18 PRESSURE TESTING

- A. Test and provide substantially airtight supply, return and exhaust ducts, plenums and casings at static pressure indicated for system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through senses of feeling or hearing at duct joints. Test ductwork for leaks at 1-1/2 times operating pressure but at a minimum of 2 inches of water.

3.19 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

3.20 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION 23 30 00

Part 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg. Metal ducts include the following:
 - 1. Rectangular ducts and fittings.
 - 2. Single-wall, round spiral-seam ducts and formed fittings.
 - 3. Double-wall, round spiral-seam ducts and formed fittings.
 - 4. Duct liner.
- B. Related Sections include the following:
 - 1. Division 15 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset FRP ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
 - 2. Division 15 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
 - 3. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.03 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.
- B. NUSIG: National Uniform Seismic Installation Guidelines.

1.04 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations

showing that proposed layout will provide original design results without increasing system total pressure.

1.05 SUBMITTALS

- A. Shop Drawings: CAD-generated and drawn to 1/4 inch equals 1 foot scale. Show fabrication and installation details for metal ducts.
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating sizes and pressure classes.
 - 3. Elevations of top and bottom of ducts.
 - 4. Dimensions of main duct runs from building grid lines.
 - 5. Fittings.
 - 6. Reinforcement and spacing.
 - 7. Seam and joint construction.
 - 8. Penetrations through fire-rated and other partitions.
 - 9. Equipment installation based on equipment being used on Project.
 - 10. Duct accessories, including access doors and panels.
 - 11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Other systems installed in same space as ducts.
 - 3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
 - 4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.06 Welding certificates.

1.07 Field quality-control test reports.

1.08 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. NFPA Compliance:
 - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 - 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- C. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.

Part 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.
- D. Stainless Steel: ASTM A 480/A 480M, Type 316, and having a No. 2D finish for concealed ducts and finish matching kitchen equipment for exposed ducts.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 DUCT LINER

- A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.

- 1. Manufacturers:

- a CertainTeed Corp.; Insulation Group.
- b Johns Manville International, Inc.
- c Knauf Fiber Glass GmbH.
- d Owens Corning.

- 2. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.

- e Thickness: 1 inch.

- f Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.

- g Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.

- h Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

- i Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

- 1) Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.

- 2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into air stream.

- 3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

- B. Flexible Elastomeric Duct Liner: Comply with NFPA 90A or NFPA 90B.

- 1. Manufacturers:

- a Armstrong World Industries, Inc.
- b Imcoa.

2. Materials: Unicellular polyethylene thermal plastic, preformed sheet insulation complying with ASTM C 534, Type II, except for density.
 - c Thickness: 1 inch.
 - d Thermal Conductivity (k-Value): 0.24 at 75 deg F mean temperature.
 - e Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM C 411.
- fLiner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
3. Application: Ducts serving kitchen or food preparing areas.

2.04 SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
- B. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.
- C. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.
- D. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.05 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
 3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
 3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

2.06 RECTANGULAR DUCT FABRICATION

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
 2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
1. Manufacturers:
 - a Ductmate Industries, Inc.
 - b Ward Industries, Inc.
 - c Or equal.
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
1. Manufacturers:

- a Ductmate Industries, Inc.
- b Lockformer.
- 2. Duct Size: Maximum 30 inches wide and up to 2-inch wg pressure class.
- 3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
- D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

2.07 APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
- B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
- C. Butt transverse joints without gaps and coat joint with adhesive.
- D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
- G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
- H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - 1. Fan discharges.
 - 2. Intervals of lined duct preceding unlined duct.
 - 3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

- I. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - 1. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
- J. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.
- K. Install in first 15 feet of duct connected to units.

2.08 ROUND AND FLAT-OVAL DUCT AND FITTING FABRICATION

- A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.
- B. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
 - 1. Manufacturers:
 - a McGill AirFlow Corporation.
 - b SEMCO Incorporated.
- C. Duct Joints:
 - 1. Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
 - 2. Ducts 21 to 72 Inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
- D. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.
- E. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.
- F. Fabricate elbows using die formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-

1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:
 - a Ducts 3 to 36 Inches in Diameter: 0.034 inch.
 - b Ducts 37 to 50 Inches in Diameter: 0.040 inch.
 - c Ducts 52 to 60 Inches in Diameter: 0.052 inch.
 - d Ducts 62 to 84 Inches in Diameter: 0.064 inch.
3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
 - e Ducts 3 to 26 Inches in Diameter: 0.034 inch.
 - f Ducts 27 to 50 Inches in Diameter: 0.040 inch.
 - g Ducts 52 to 60 Inches in Diameter: 0.052 inch.
 - h Ducts 62 to 84 Inches in Diameter: 0.064 inch.
4. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single thickness turning vanes.
5. Round Elbows 8 Inches and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
6. Round Elbows 9 through 14 Inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
7. Round Elbows Larger Than 14 Inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
8. Die-Formed Elbows for Sizes through 8 Inches in Diameter and All Pressures 0.040 inch thick with 2-piece welded construction.

9. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
10. Pleated Elbows for Sizes through 14 Inches in Diameter and Pressures through 10-Inch wg: 0.022 inch.

Part 3 EXECUTION

3.01 DUCT APPLICATIONS

- A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
 1. Supply Ducts: 2-inch wg.
 2. Supply Ducts (before Air Terminal Units): 2-inch wg.
 3. Supply Ducts (after Air Terminal Units): 1-inch wg.
 4. Return Ducts (Negative Pressure): 1-inch wg.
 5. Exhaust Ducts (Negative Pressure): 1-inch wg.
- B. All ducts shall be galvanized steel except as follows:
 1. Range Hood Exhaust Ducts: Comply with NFPA 96.
 - a Concealed: Carbon-steel sheet.
 - b Exposed: Type 304, stainless steel with finish to match kitchen equipment and range hood.
 - c Weld and flange seams and joints.
 2. Dishwasher Hood Exhaust Ducts:
 - d Type 304, stainless steel with finish to match kitchen equipment and range hood. Weld and flange seams and joints.
 - e Aluminum, with seams and laps arranged on top of duct.
 3. Underground Ducts:
 - f Concrete encased galvanized steel.

3.02 DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

- B. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, size, and shape and for connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.
- F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."
- O. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

- P. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."
- Q. Paint interiors of metal ducts, that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.03 UNDERSLAB DUCTS, SPECIAL INSTALLATION REQUIREMENTS

- A. Verify undamaged condition of ducts before enclosure with fill or encasement.
- B. Protect ducts from damage by equipment used in placing fill materials and concrete on or around ducts.
- C. Protect duct openings from damage and prevent entrance of foreign materials.

3.04 RANGE HOOD EXHAUST DUCTS, SPECIAL INSTALLATION REQUIREMENTS

- A. Install ducts to allow for thermal expansion through 2000 deg F temperature range.
- B. Install ducts without dips or traps that may collect residues unless traps have continuous or automatic residue removal.
- C. Install access openings at each change in direction and at intervals defined by NFPA 96; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.
- D. Do not penetrate fire-rated assemblies except as permitted by applicable building codes.

3.05 SEAM AND JOINT SEALING

- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.
 - 1. For pressure classes lower than 2-inch wg, seal transverse joints.
- B. Seal ducts before external insulation is applied.

3.06 HANGING AND SUPPORTING

- A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
- B. Support vertical ducts at maximum intervals of 16 feet and at each floor.
- C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

- D. Install concrete inserts before placing concrete.
- E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

3.07 CONNECTIONS

- A. Make connections to equipment with flexible connectors according to Division 15 Section "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.08 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
 - 1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
 - 3. Determine leakage from entire system or section of system by relating leakage to surface area of test section.
 - a Allowable Leakage, Supply Duct Systems: 1 percent of design airflow.
 - b Allowable Leakage, Return Duct Systems: 2 percent of design airflow.
 - c Allowable Leakage, Exhaust Supply Duct Systems: 2 percent of design airflow.
 - d Allowable Leakage, Supply Duct Systems, Terminals to Air Outlets: 2 percent of design airflow.
 - 4. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg.

5. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

END OF SECTION 23 31 13

Part 1 GENERAL SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Volume dampers.
3. Turning vanes.
4. Duct-mounting access doors.
5. Flexible connectors.
6. Flexible ducts.
7. Duct accessory hardware.

B. See Division 16 Section "Fire Alarm" for duct-mounting fire and smoke detectors.

1.02 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Volume dampers.
3. Turning vanes.
4. Duct-mounting access doors.
5. Flexible connectors.
6. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Special fittings.
2. Manual-volume damper installations.
3. Combination fire- and smoke-damper installations, including sleeves and duct-mounting access doors.

4. Wiring Diagrams: Power, signal, and control wiring.

1.03 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

Part 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Stainless Steel: ASTM A 480/A 480M.
- D. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: ASTM B 221, alloy 6063, temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 BACKDRAFT DAMPERS

- A. Manufacturers:

1. Duro Dyne Corp.
 2. Ruskin Company.
- B. Description: Multiple-blade, parallel action gravity balanced, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.
- C. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
- D. Blades: 0.050-inch- thick aluminum sheet.
- E. Blade Seals: Neoprene.
- F. Blade Axles: Galvanized steel.
- G. Tie Bars and Brackets: Galvanized steel.
- H. Return Spring: Adjustable tension.

2.04 VOLUME DAMPERS

- A. Manufacturers:
1. Duro Dyne Corp.
 2. Ruskin Company.
- B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
- C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
 2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
 3. Blade Axles: Galvanized steel.
 4. Bearings: Oil-impregnated bronze.

5. Tie Bars and Brackets: Galvanized steel.
- D. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
- E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.05 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.
- B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- wide, single-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.
 1. Manufacturers:
 2. Ductmate Industries, Inc.
 3. Duro Dyne Corp.
 4. METALAIRE, Inc.
 5. Ward Industries, Inc.

2.06 DUCT-MOUNTING ACCESS DOORS

- A. General Description: Fabricate doors airtight and suitable for duct pressure class.
- B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.
 1. Manufacturers:
 - a CESCO Products.

- b Ductmate Industries, Inc.
 - c Flexmaster U.S.A., Inc.
 - d Greenheck.
 - e McGill AirFlow Corporation.
 - f Ventfabrics, Inc.
 - g Ward Industries, Inc.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Provide number of hinges and locks as follows:
 - h Less Than 12 Inches Square: Secure with two sash locks.
 - i Up to 18 Inches Square: Two hinges and two sash locks.
 - j Up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
 - k Sizes 24 by 48 Inches and Larger: One additional hinge.
 - C. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
 - D. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.07 FLEXIBLE CONNECTORS

- A. Manufacturers:
 1. Duro Dyne Corp.
 2. Ventfabrics, Inc.
 3. Ward Industries, Inc.
- B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- C. Flexible Connector Fabric: Glass fabric double coated with neoprene.
 1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

3. Service Temperature: Minus 40 to plus 200 deg F.

2.08 FLEXIBLE DUCTS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Flexmaster U.S.A., Inc.
3. Hart & Cooley, Inc.
4. McGill AirFlow Corporation.

B. Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

2.09 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pilot tube and other testing instruments and of length to suit duct insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

Part 3 EXECUTION

3.01 APPLICATION AND INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

- C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.
- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.
- F. Provide test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.
- H. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
 - 1. On both sides of duct coils.
 - 2. Downstream from volume dampers, turning vanes, and equipment.
 - 3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
 - 4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot spacing.
 - 5. On sides of ducts where adequate clearance is available.
- I. Install the following sizes for duct-mounting, rectangular access doors:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body Plus Ladder Access: 25 by 17 inches.
- J. Install the following sizes for duct-mounting, round access doors:
 - 1. One-Hand or Inspection Access: 8 inches in diameter.
 - 2. Two-Hand Access: 10 inches in diameter.

- 3. Head and Hand Access: 12 inches in diameter.
- 4. Head and Shoulders Access: 18 inches in diameter.
- 5. Body Access: 24 inches in diameter.
- K. Label access doors according to Division 15 Section "Mechanical Identification."
- L. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
- M. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers or light troffer boots to low pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- O. Connect flexible ducts to metal ducts with draw bands.
- P. Install duct test holes where indicated and required for testing and balancing purposes.

3.02 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire and smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION 23 33 00

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.02 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
 - (1) Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
 - (2) Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - (1) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - (2) Products: Subject to compliance with requirements, provide one of the products specified.
 - (3) Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - (4) Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 GRILLES AND REGISTERS

- A. Fixed Face Register RAR - #:
 - (1) Products:

- a. Titus; 350 FL.

- (2) Manufacturers:
 - a. Titus.
 - b. Kreuger
 - c. Metal-Aire
- (3) Material: Aluminum.
- (4) Finish: Baked enamel, white.
- (5) Frame: 1 inch wide.
- (6) Mounting: Concealed or Lay in to match ceiling type.
- (7) Accessories:
 - a. Provide 24 x 24 filler panel for registers in T-bar ceilings.

2.03 CEILING DIFFUSER OUTLETS

A. Rectangular and Square Ceiling Diffusers CD - #:

- (1) Products:
 - a. Titus; MCD.
- (2) Manufacturers:
 - a. Titus.
 - b. Kreuger
 - c. Metal-Aire
- (3) Material: Aluminum.
- (4) Finish: Baked enamel, white .
- (5) Mounting: To match ceiling type.
- (6) Pattern: Adjustable 4 way.
- (7) Accessories:
 - a. Provide 24 x 24 filler panel for diffusers in T-bar ceiling.

B. Specialty Diffuser SD-#

- (1) Products:
 - a. Seiho PK
- (2) Manufacturers:
 - a. Seiho
- (3) Material: Aluminum.
- (4) Finish: Anodized aluminum.
- (5) Mounting: Surface.
- (6) Dampers: Adjustable blade.
- (7) Accessories:
 - a. Neoprene gasket.

2.04 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- D. Paint behind registers with two coats of flat black paint.

3.02 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Indoor and outdoor air handling units.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 23 0500: Common Work Results for HVAC.
3. Section 23 0513: Basic Mechanical Materials and Methods.
4. Section 23 0548: Mechanical Sound, Vibration and Seismic Control.
5. Section 23 0700: Mechanical Insulation.
6. Section 23 8000: Heating, Ventilation and Air Conditioning Equipment.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA):

1. AMCA 211 – Certified Ratings Program - Product Rating Manual for Fan Air Performance.
2. AMCA 300 – Reverberant Room Method for Sound Testing of Fans.
3. AMCA 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

B. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):

1. AHRI 410 – Forced Circulation Air-Cooling and Air-Heating Coils.

C. American Society for Testing and Materials International (ASTM):

1. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
2. ASTM D2247 – Standard Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity.

3. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. National Fire Protection Association (NFPA):
1. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems.
- E. Underwriters Laboratories, Inc. (UL):
1. UL 181 – Standard for Factory-Made Air Ducts and Air Connectors.
 2. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.
 3. UL 1995 – Heating and Cooling Equipment.
- F. Underwriters Laboratories of Canada (ULC):
1. CAN/ULC-S102.2 – Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
- G. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
1. ASHRAE Standard 62.1 – Ventilation for Acceptable Indoor Air Quality.
- H. National Electrical Manufacturers Association (NEMA):
1. NEMA – MG 1, Table 12-10: NEMA Threshold Full-Load Nominal Efficiency Values for Energy-Efficient Motors.

1.03 DEFINITIONS

- A. Hereinafter, a Class "A" thermal break shall be defined as a thermal break that ensures no member on the exterior of the unit, including fasteners, has through metal contact with any member on the interior of the unit, including fasteners.
- B. Hereinafter, wall assemblies shall include all unit wall panels around the air tunnel perimeter, all channels exposed to both the interior and exterior of the unit, and all removable wall access panels.
- C. Hereinafter, door assemblies shall include interior and exterior unit door panels, door frames, and door channels.

- D. Hereinafter, roof assemblies shall include exterior unit roof panels, interior unit ceiling panels, and all roof channels exposed to both the interior and exterior of the unit.

1.04 SCOPE OF WORK

- A. The AHU Manufacturer's work shall include, but is not necessarily limited to the following:

1. Furnish a complete set of submittals as described hereinafter.
2. Provide AHUs fully factory assembled with the exception of unit splits as required for shipping or installation requirements as determined by the installing contractor. As shipped from the AHU Manufacturer, AHUs shall meet the performance requirements shown on the equipment schedule. Units shall be for outdoor application and shall have all components and options as indicated on the schedule or drawings. Furthermore, units shall be constructed as detailed hereinafter. Field-provide components and options shall be unacceptable unless otherwise noted.
3. Provide all labor, materials, and equipment necessary for the complete engineering, production, factory assembly, factory testing, packaging, and delivery of the custom AHUs and their related equipment. Controls contractor to provide control end devices and unit controllers, for factory mounting and wiring.
4. Permit the Owner and Engineer to inspect as herein described and to witness performance tests to ensure good product quality and compliance with these specifications.
5. Factory test all AHUs as detailed herein and on the schedule.
6. Provide a factory-authorized service representative employed by the AHU Manufacturer to supervise installation and start-up of the units as herein described.
7. Provide Owner's Manual, complete operating instructions.

- B. Mechanical Contractor whose work will generally include the following:

1. Receive and unload the custom AHUs. Inspect the unit sections as they arrive on the job site. Notify the trucking company, AHU Manufacturer, and Owner of any shipping damage immediately.
2. Coordinate all work associated with the AHU installation. Schedule with the AHU Manufacturer for a factory-authorized service person employed by the AHU Manufacturer to supervise unit installation. Clear area where unit is to be set of any construction materials or

debris. Ensure equipment curbs or support platforms are level prior to setting the units. Hoist and set units in their proper position. Use spreader bars to hoist the unit (sections) to avoid damaging units. If units ship in multiple sections, provide all labor and equipment for placing and field joining sections.

3. Provide all final chilled water, hot water, glycol water, steam, and drain piping connections. Release the fan spring isolator shipping restraints.
4. Remove all foreign objects and thoroughly clean the interior and exterior surfaces of the units with a mild detergent (soap and water). Do not use any abrasives or solvents without first consulting the AHU Manufacturer.
5. Install filter media in filter frames. Operating units without filter media is strictly prohibited.
6. Perform unit start up as detailed herein under the guidance and supervision of a factory-authorized service person employed by the AHU Manufacturer.

C. Electrical Contractor work will generally include the following:

1. Provide wiring between Owner's normal/emergency power source and the units.
2. Perform unit start up as detailed herein under the guidance and supervision of a factory-authorized service person employed by the AHU Manufacturer.

1.05 BID REQUIREMENTS

- A. The AHUs shall meet the performance criteria as indicated on the schedule and drawings.
- B. Base Bid AHU Manufacturers: Alliance (Basis of Design), PACE, Solutions.
- C. Naming of manufacturers does not imply that their standard construction is acceptable, nor does it imply that their products are automatically approved. A manufacturer who is not the basis of design is required, 14-days prior to bid, to submit to the mechanical engineer, proposed equipment, along with a comparison letter addressing each item in the specification and stating compliance with the specifications. This proposed submittal must be approved in writing by the mechanical engineer a minimum of 3- days prior to bid date. Approval will be at the discretion of the mechanical engineer. There shall be no exceptions to this requirement, and submittals of manufacturers who have not obtained written approval prior to bid will be rejected without review, and returned. The Mechanical Contractor shall be

responsible for all additional costs incurred by the Engineer during the submittal and re-submittal phases for any contract awarded to a manufacturer not on the approved list.

- D. All AHU Manufacturer's that are not basis of design shall deliver selection data to the bid examiner. Selection shall include the following:
 - 1. Fan performance curves, coil performance, and unit discharge, inlet, and certified radiated sound power levels.
 - 2. Unit casing thermal performance at design supply air temperature graphed on a psychometric chart.
 - 3. A list of all exceptions and clarifications the AHU Manufacturer is taking to the specifications.
- E. To ensure injected closed-cell foam is properly engineered for rigidity and thermal performance, is amply applied to fill all cavities within each assembly, and is correctly cured to yield strong adhesion to casing members, the AHU Manufacturer shall have experience using injected closed-cell foam as an insulation in AHUs for no less than 5 years.
- F. Mechanical contractor shall carry full responsibility for any AH equipment that don't fit or don't meet the acoustical requirements of each designated area, at its own expense acoustical traps or leak test shall be done for any field modification.
- G. Contractor shall bare additional cost for new structural & acoustical calculations by using another listed brand.

1.06 SUBMITTALS

- A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Owner or Owner's approved representative.
- B. AHU Manufacturer shall provide the following information with each shop drawing/product data submission:
 - 1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, support locations, and weights. Drawings shall also indicate all electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations. Each component of the unit shall be identified and shall include physical dimensions and material of construction.
 - 2. Panel-to-panel joint and corner details and panel-to-roof details, all showing Class "A" thermal breaks.

3. All performance data, including capacities and airside and waterside pressure drops, for components. AMCA-certified fan curves shall be provided with specified operating point clearly plotted. AMCA-certified sound power level data for fan inlet and outlet at fan rated capacity shall be provided. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, and 4000 Hz based on AHRI 260 fan in unit testing.
 4. Brand and model of fans, fan motors, coils, air filters, dampers, outside and return air measuring stations, and unit DDC controllers being furnished.
- C. The AHU Manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.
- D. The AHU Manufacturer shall list any exceptions to the specification.

1.07 WARRANTY AND SERVICE

- A. AHU Manufacturer shall provide a parts & labor warranty extending 12 months from start-up or 18 months from shipment, whichever comes first.
- B. The AHU Manufacturer shall have a service department located within 50 miles of the job site, and 4 hour respond 24/7.

1.08 QUALITY ASSURANCE

- A. Qualifications of Manufacturers and Installers: Comply with provisions in Section 23 0500: Common Work Results for HVAC.
- B. Sound Level Measurements and Calculations:
1. Sound power level measurements and calculations shall be made in complete accordance with latest version of AMCA Standard 300, Methods for Calculating Fan Sound Ratings from Laboratory Test Data, and AMCA Standard 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
 2. The results of all testing shall be certified by independent testing agency or an AMCA-approved testing laboratory and submitted to architect for approval. The submittal shall include a complete description of test conditions, methods and procedures, including specific installation type used for measurements, as detailed in AMCA 300.

- 3. Maximum Allowable Sound Power Levels: Maximum allowable sound power levels for supply discharge, return intake, and casing radiated noise shall not exceed values given in schedule below as indicated on drawings with equipment operating at design airflow and static pressure conditions.
- C. Factory Leak Testing: Manufacturer shall provide a factory leak test on units at design total static pressure across the cabinet exterior walls. Cabinet leakage shall not exceed 1 percent of specified airflow on the operating side of the unit. All panels shall be sealed with closed cell gasketing material. A written test report shall be prepared by the manufacturer and submitted to the Architect.
- 1.09 PROJECT RECORD DOCUMENTS
 - A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 0500: Common Work Results for HVAC.
- 1.10 PRODUCT HANDLING
 - A. Protection, Replacements, Delivery and Storage: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC.
- 1.11 COORDINATION
 - A. Coordinate related and adjacent activities in accordance with provisions of Section 01 3113: Project Coordination.
- 1.12 WARRANTY AND SERVICE
 - A. AHU Manufacturer shall provide a parts & labor warranty extending 12 months from start-up or 18 months from shipment, whichever comes first.
 - B. The AHU Manufacturer shall have a service department located within 50 miles of the job site, and 4 hour respond 24/7.

PART 2 – PRODUCTS

- 2.01 PACKAGED AIR HANDLING UNIT: AGENCY LISTING
 - A. AHUs shall be agency listed to UL 1995 by UL or ETL.
 - B. Manufacturer: York, Carrier, or approved equal.

2.02 UNIT NAMEPLATES AND LABELS

- A. Metal nameplates shall be provided on the units. All information contained on the nameplate shall be etched or burned into the surface to prevent fading. Information shall include:
 - 1. Job name, sales order number, unit tagging, and service model number.
 - 2. MCA, MOP, and maximum fuse/HACR circuit breaker size.
 - 3. Voltage, frequency, phase, Hp, FLA, and inverter input current for all motors.
- B. Labels for AHRI Standard 410 and the listing agency, either UL or ETL, shall be provided on the units.
- C. Labels shall be provided on the units for unit rigging and coil piping and connection instructions. Labels shall be provided on fans indicating direction of rotation. Warning labels shall be provided on appropriate components indicating hazardous voltage. For each section which must be assembled to another, matching steel identification tags shall be welded at each mating joint to ensure correct assembly order.

2.03 UNIT CONSTRUCTION

- A. Casing Performance
 - 1. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
 - 2. Casing deflection shall not exceed $L/200$ at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.
 - 3. Under scheduled supply air temperature and design conditions on the exterior of the unit of 79°F dry bulb and 68°F wet bulb, condensation shall not form on the casing exterior. The AHU Manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU Manufacturer shall provide, in writing, a guarantee against condensation forming on the unit exterior under the scheduled supply air temperature and design conditions on the exterior of the unit of 79°F dry bulb and 68°F wet bulb. The guarantee shall note that the AHU Manufacturer will cover all expenses associated with modifying

units in the field should external condensate form on them. Copies of the guarantee shall be provided to the Engineer and the Owner.

4. IBC Seismic Certification

- a. All AHUs shall be certified for seismic applications in accordance with the following International Building Code (IBC) releases: IBC 2000, 2003, 2006, 2009.
- b. Seismic qualification testing and structural analysis shall be conducted in accordance with and strict adherence to the standards set forth within ASCE 7 by an independent approval agency with a complete list of certified models, options, and installation methods provided in an approved detailed report. The AHUs shall be approved for seismic applications when properly installed and used as intended. The basis of the certification shall be obtained through a combination of testing of the active and energized components per AC156, and analysis of the main force resisting members of the unit. Additional calculations shall be conducted to ensure components, accessories, and options remained intact and attached to the unit under seismic load conditions.
- c. The certification shall be based on a maximum Design Structural Response Acceleration at Short Period (Sds) value of 1.85 g's for IBC 2006 and 2009, and 1.93 g's for IBC 2000 and 2003. This is obtained from the Maximum Considered Earthquake Short Period Spectral Response Acceleration, Ss, of 2.78 g's or 2.90 g's as determined by the ASCE 7 seismic maps for Soil Site Class B with 5 percent damping. When the site soil properties or final equipment installation location are not known, the soil site coefficient, Fa, defaults to the Soil Site Class D coefficient. Occupancy Category IV and Seismic Design Category C shall be covered under this certification, limited by the Sds value stated above. A seismic importance factor, Ip, of 1.5 shall apply to the certification to include essential facility requirements and life safety applications for post event functionality.
- d. For IBC 2000 and 2003, $FP/WP = 0.4 \times 2/3(S_s=2.90) \times (F_A=1) \times (I_P=1.5) \times (\alpha_P/RP=0.40) \times (1+2(z/h=1.0)) = 1.39 \text{ g's}$. For IBC 2006 and 2009 $FP/WP = 0.4 \times 2/3(S_s=2.78) \times (F_A=1) \times (I_P=1.5) \times (\alpha_P/RP=0.42) \times (1+2(z/h=1.0)) = 1.39 \text{ g's}$
- e. Structural floors, housekeeping pads, supporting curbs, and supporting steel must be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads. Installation details such as

special inspection, attachment to a curb, or attachment to a non-building structure must be outlined and approved by the Engineer of Record for the project or building. The installing contractor shall be responsible for the proper installation of the equipment and must observe the seismic installation requirements set forth by the Engineer of Record.

B. Bases & Floors

1. Base shall be construction from welded structural aluminum channels around the perimeter and welded structural aluminum cross members. Formed channels are not acceptable. The structural aluminum base shall be shot blasted, fully welded and then painted. The maximum cross-member spacing shall be 24" on center with members located adequately to support fan, coils, and other large components. The height of each base channel shall be no less than the height indicated in the drawings. Each shipping section shall be provided with removable lifting lugs. Structural framework shall fully support the unit casing and all components during installation such that no section deflects more than $L/1000$ during rigging of that section, where L is defined as the distance between lifting lugs.
2. AHU Floor shall be constructed from 0.063" aluminum safety tread plate surface. The floor surface shall be continuously welded with 2" turned up lip around the base perimeter and all floor penetrations. Caulk is not an acceptable sealing method for the floor. Floor drains shall be located in the floor to drain all sections. Floor drains shall be a minimum of 1.5" in diameter and shall be piped to the exterior of the unit base. Floor deflection shall not exceed $L/200$ under a point load of 200 pounds, where L is defined as the floor span. A 0.025" thick aluminum liner shall be attached to the underside of the unit base and cross members, ensuring that the floor insulation is completely encapsulated.
3. Insulation that meets a minimum R-value of 12.5 shall be minimum 2" thick and shall be provided underneath the entire unit floor. Insulation shall be closed-cell foam to prevent wicking of moisture. Insulation shall completely fill the panel cavity in all directions so that no voids exist. Base assemblies shall comply with NFPA 90 A.
4. Safety grates that provide a walking surface shall be provided across all bottom air openings. Safety grates shall support a minimum 300-pound load. Safety grates shall be made of Type IWA welded rod with a cross flow pattern of 1.1875" x 4". Grating shall be aluminum construction for units with aluminum floors. Safety grates shall be removable to ensure adequate access to the ductwork below.

C. Walls

1. Wall assemblies shall be double-wall construction with 0.063" thick textured aluminum solid exterior and 0.025" thick smooth aluminum interior. The entire unit shall have a solid wall aluminum liner on the interior, except for the fan section, which shall have perforated wall liner. All spaces and joints of wall assemblies shall be completely sealed. Wall shall meet the casing deflection limits contained herein. Bolting of wall panels shall be 304 stainless on maximum 8" centers. Sheet metal or Tek fasteners are not acceptable for sealing pressure containing panels.
2. A Class "A" thermal break shall be provided throughout the entire wall assembly.
3. Insulation that meets a minimum R-value of 12.5 shall be minimum 2" thick with minimum 1.5 pound/cu.ft density, and shall be provided throughout all unit wall assemblies. Insulation shall be fiberglass and completely wrapped with long-strand fiberglass cloth to limit the entrainment of moisture into the insulation. The long-strand fiberglass cloth shall also incorporate an anti-microbial coating to suppress microbial growth. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Wall assemblies shall comply with NFPA 90 A.
4. Removable wall access panels shall be provided in coil and fan sections for service removal of components. A Class "A" thermal break shall be provided throughout all removal wall access panels.
5. Fan sections shall include 0.025" perforated aluminum interior sheet metal liners in fan blast area. Insulation in sections lined with perforated sheets shall be faced with neoprene.
6. Cooling coil and direct evaporative sections shall include 20 gauge 304 stainless steel liner.
7. All floor openings shall have 1" minimum flange up around entire perimeter.

D. Access Doors

1. Access doors shall be provided throughout units as indicated on the schedules and drawings. Access doors shall be double wall construction. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels, respectively.
2. A Class "A" thermal break shall be provided on all door assemblies downstream of the cooling coil.
3. Insulation that meets a minimum R-value of 12.5 shall be provided throughout all door assemblies. Insulation shall be injected foam.

Foam shall be closed cell to prevent wicking of moisture. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Door assemblies shall comply with NFPA 90 A.

4. All doors shall be a minimum of 60" high if sufficient height is available, or the maximum height allowed by the unit height. All doors shall open against pressure to ensure an airtight seal and to prevent a safety hazard.
5. Door hinges shall be die-cast zinc with provision for adjustment without the use of shims or special tools. Door latches and handles are to be bolted to the unit and made with corrosion resistant materials. Bolts, nuts and shafts for door latches, handles and hinges shall be made of zinc plated steel. Door latch and pawl assembly shall be industrial quality and corrosion resistant with a handle on both the inside and outside of door. Latching mechanism shall be of conical roller design. Latch and pawl assembly shall be bolted together without the use of set screws. All doors to fan sections shall be provided with latches which require a tool to open.
6. Windows shall be provided on doors in fan sections. Windows shall be mounted in a metal frame and shall be a minimum of 8" x 8", with wire-reinforced safety glass. For any instance where a window cannot fit in a door, a narrower window 8" tall may be provided. Windows in doors with a thermal break shall be thermal, double-pane type.

E. Roofs

1. Roof assemblies shall be double wall construction. Exterior roof panels and interior ceiling panels shall be of the same construction as the exterior and interior wall panels, respectively. Sections in units with perforated interior wall liners shall have perforated interior ceiling liners. For perforated liners, a triple-wall panel shall be provided. This triple-wall panel shall be constructed such that two layers of the panel are solid, with the afore-mentioned class of thermal break between them to isolate the supply air from contact with the outside panel. The third, inner liner shall be perforated. All spaces and joints of roof assemblies shall be completely sealed. In addition to meeting the casing deflection limits contained herein, roof deflection shall not exceed $L/200$ under a point load of 200 pounds, where L is defined as the roof panel span.
2. Outdoor unit roofs shall incorporate a standing seam on the exterior to ensure a rigid roof construction. Outdoor roofs shall be sloped, not less than 1/4" per foot for water drainage. Where outdoor units are shipped in multiple sections, provide standing-seam joiners at each split with adhesive, hardware, and cover strips for field joining by the

installing contactor. On outdoor units, rain gutters shall be provided over all doors to direct rain away from the door assembly.

3. Shall be a single piece top panel.
4. Shall be embossed to increase rigidity and prevent sagging.

F. Shipping Splits

1. Shipping splits shall be provided as indicated on the schedule and drawings. Heavy-gage gussets shall be provided in the corners of each split on the unit interior to minimize the opportunity for racking of the section during shipping and rigging. Structural members shall be provided at the base of the unit exterior to enable pull together of each shipping split.

G. Condensate Pan and connections

1. Shall be an internally sloped condensate drain pan made of a non corrosive material.
2. Shall comply with ASHRAE Standard 62.
3. Shall use a 3/4" NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.

2.04 UNIT COMPONENTS

A. Dampers

1. Approved manufacturers: TAMCO, Ruskin.
2. Damper Sections: Dampers shall be low leakage type with airfoil blade design. All dampers shall carry the AMCA Standard 500 certification label. Air leakage through a 48" x 48" damper shall not exceed 10 CFM/ft².
3. Blade gasket shall be extruded EPDM elastomer secured in an integral slot within the aluminum extrusion. Frame seals shall be extruded TPE thermoplastic. Overlapping blade design shall compress seals to ensure tight seal on closure.
4. Damper frame shall be extruded aluminum with a thickness of not less than .080" and a depth of 4". Pivot rods shall be 7/16" hexagon extruded aluminum interlocking into blade section.
5. Bearings shall be double seal with an inner bearing fixed to the rod within a polycarbonate outer bearing inserted into the frame so that

the outer bearing cannot rotate. Bearings shall be designed so that there is no metal to metal contact.

6. Linkage hardware shall be installed outside of the frame and constructed of corrosion resistant aluminum and zinc plated steel.

B. Air Filters

1. Approved manufacturers: Flanders, American Air filters, and Farr.
2. All filters shall be 12" x 24", 24" x 24", 24" x 20", or 20" x 20" nominal sizes to minimize the number of sizes required to be stocked by the Owner. Filters of other nominal sizes will not be acceptable.
3. Prefilters shall be minimum 2" thick, pleated disposable type. Prefilters shall be UL Class 2 when tested in accordance with UL Standard 900
4. Medium Efficiency mini Pleat Media Filters or rigid box filters
 - a. Pleated media filters 4" or 12" deep shall be provided as indicated on the schedule and drawings. The MERV 13 rating shall be tested in accordance with ANSI/ASHRAE 52.2. Filter media shall be of non-woven fibers with metal grid support. Filters shall be provided with an anti-microbial coating. One set of extra filters shall be provided with each unit.
 - b. Filters shall be UL Class 2 when tested in accordance with UL Standard 900.
5. Filters shall be provided with front-loading frames. Filter holding frames shall be constructed of stainless steel and equipped with foam gaskets to seal filters against filter frames. Frame seams shall be sealed to eliminate air bypass. Front-loading frames shall be equipped with filter fasteners of the same material as the filter frame. Filter fasteners shall be capable of being installed without the use of special tools, bolts or nuts. Filter holding frames shall be of a universal type to accommodate standard filters of the same nominal size as well as appropriate fasteners. Filter access shall be as indicated on the schedule and drawings.
6. A Digihelic differential pressure gauge shall be provided factory installed for measuring the
7. pressure drop across each filter bank. The gauge shall be a diaphragm-actuated dial type, 4¾" O.D., with white dial, black figures and graduations and pointer zero adjustment.

C. Refrigerant Coils

1. Coil performance shall be provided as indicated on the schedule and drawings. Coil capacities, pressure drops and selection procedures shall be certified to AHRI Standard 410.
2. DX coil performance, circuiting, hot gas bypass line and piping layout shall be selected in accordance with the condenser unit requirements.
3. Refrigerant shall be 410A or other Enviro-safe types.
4. DX coils shall be provided as indicated on the schedule and drawings.
5. DX coils shall have 0.006" thick copper fins. Fins shall be mechanically bonded to 3/8" OD seamless copper tubes with 0.020" thick walls. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion. All returns bends shall have a minimum wall thickness of 0.025" and shall be brazed and individually removable. Hairpin return bends are not allowed. Coils shall be circuited for counter-flow heat transfer. Coil casings shall be constructed of stainless steel.
6. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Unit shall use a Thermostatic Expansion Valve (TXV) or orifice for refrigeration control.
 - b. TXV shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
 - c. Refrigerant filter drier Solid core design.
 - d. Service gauge connections on suction and discharge lines.

C. Compressors

1. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.
2. Two stage 6 ton> units shall use fully hermetic, 2-stage compressors.
3. Three stage 7.5-12.5 ton units shall use one fully hermetic 2 stage compressor and one fully hermetic scroll compressor.
4. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
5. Compressors shall be internally protected from high discharge temperature conditions.
6. Compressors shall be protected from an over temperature and over amperage conditions by an internal, motor overload device.
7. Compressor shall be factory mounted on rubber grommets.

8. Compressor motors shall have internal line break thermal, current overload and high-pressure differential protection.
9. Crankcase heaters shall not be required for normal operating range, unless provided by the factory.

D. Primary Drain Pans

1. Primary condensate drain pans shall be provided in cooling coil sections as detailed in the drawings. Drain pans in cooling coil sections shall be 304 stainless steel. Primary drain pans shall extend under each entire coil bank, including headers and return bends. Primary drain pans shall extend downstream of the coil bank for a minimum distance as indicated in the drawings. Primary drain pans shall be sloped a minimum of 1/8" per foot, shall be a minimum of 2" deep, and shall be double-sloped (sloped in 2 planes) to positively drain. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum of 1-1/2" beyond the base to ensure adequate room for field piping of condensate drain traps. Drain connection locations (handing) shall be as indicated on the schedule and drawings. Any coil support member located inside a primary drain pan shall be of the same material as the drain pan. Coil drain pans shall be supported by structural aluminum members under the floor.

6. Intermediate Drain Pans

- a. For cooling coil sections requiring stacked coils, sloped intermediate drain pans constructed of stainless steel shall be provided under each upper-level coil in the coil bank and shall extend under the entire coil, including headers and return bends. Intermediate drain pans shall extend downstream of the leaving face of the coil bank for a minimum of 4". Non-corrosive pipe with a minimum diameter of 1" shall be connected to each end of all intermediate drain pans, and shall be piped to the primary drain pan of the coil section. Any coil support member located inside an intermediate drain pan shall be of the same material as the drain pan.

D. Fans

1. Fan shall be SWSI Direct drive arrangement 4 as indicated on the schedule, minimum Class 2. Wheels are high efficiency, non-overloading type backward inclined airfoil blade design. Wheels contain 9 blades and are constructed from extruded aluminum. Fans shall be designed with reinforced steel inlet plate, structural steel frame, shaft, and bearings. Each fan assembly, including sheaves and belts, shall be trim balanced at the factory in accordance with ANSI

204-96 to Balance Quality Grade G6.3. Fans shall be rated in accordance with AMCA Standard 210 for air performance and AMCA 300 for sound. All fans shall carry the AMCA certification label

2. Fans shall be isolated with manual blankoffs to prevent backflow in the event of individual fan failure.
3. Nameplate motor horsepower for all fans, including dual fans, shall be at least 10% greater than design brake horsepower of each fan.
4. Motors shall be premium efficiency, NEMA Design B, TEFC, with Class B insulation. Minimum service factor shall be 1.15 and motors shall not be selected to operate in the service factor. Each fan/ fan array shall be provided with a VFD, as well as a redundant VFD with automatic switchover.
5. Aegis SGR motor bearing protection ring kit provided for each motor that is connected to a VFD. Protects motors from catastrophic failure and channels harmful VFD induced shaft currents to ground.
6. Fan Air Flow Measuring Stations: The flow measuring station shall consist of total pressure taps located in the inlet cone of each fan, with static pressure tap located near fan inlet panel. Any flow measuring device which creates an obstruction in the fan inlet is not acceptable. Provide a Dwyer magnehelic pressure gauge with CFM scale which indicates the fan volume. Flow gauges shall be calibrated to match the flow coefficient of the fan inlet cone provided. Provide a DH3 Digihelic differential pressure switch for each fan. The transmitter shall produce a 4 – 20 mA or 0 – 5 Vdc signal linear and scaled to air volume or velocity. The transmitter shall be capable of withstanding over pressurization up to 200 times greater than span and shall be factory calibrated.
7. Fan Assembly Isolation Base: Fan and motor shall be mounted on an integral fully welded structural base. Base shall be free floating at all four corners on spring type isolators with earthquake restraints rated for Seismic Zone 4 requirements. Isolator spring deflection shall be 2" minimum or as indicated on specifications. Isolator supports shall be attached to base structural members, and welding to the floor skin is not acceptable.
8. Evaporator Fans:
 - 1) Shall be standard belt drive assembly with an adjustable pitch motor pulley.
 - a) Direct drive fan is selectable option in 3-5 ton models
 - 2) Shall use sealed, permanently lubricated ball bearing type.

3) Blower fan shall be double inlet type with forward curved blades.

4) Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

9. Condenser Fans:

1) Shall be a direct driven propeller type fan.

2) Shall have aluminum blades riveted to corrosion resistant steel spider brackets and be dynamically balanced.

E. Fan Motor

1. Evaporator Fan Motor

a) Shall have Permanently lubricated ball-bearings

b) Shall have inherent automatic reset thermal overload protection.

c) The job site selected brake horsepower shall be required to not exceed the motor's nameplate horsepower rating plus the service factor.

9. Condenser Fans:

1) Shall be a totally enclosed Motor.

2) Shall use permanently lubricated ball-bearings.

3) Shall have inherent thermal overload protection with an automatic reset feature.

4) shall have a shaft down design.

E. Service Lighting and Convenient Outlet: Guarded vapor proof marine lights factory wired to a single weatherproof switch located on exterior of cabinet. Provide weatherproof, 15 amps, GFCI receptacle near the light switch wired to the lighting circuit.

F. Outside air intake

1. Provide air flow measuring station for outside air intake. Provide transmitter with digital readout and analog output for BMS.

2. Either extruded aluminum louvers or weatherhoods shall be used at outside air intake location. Louvers shall be stationary, wind driven rain resistant drainable type with built in downspouts and furnished with

birdscreen. Blades shall be vertical and housed inside an aluminum frame mounted to the unit exterior. Weatherhoods shall be fabricated from aluminum and painted the same finish as unit exterior. Weatherhood openings are lined with 1/2" galvanized mesh bird screen. Weatherhoods are designed for 750 fpm maximum face velocity.

- G. Electrical Wiring: Provide single point power connection with a non-fused manual disconnect of the proper amp rating in the control cabinet for each air handling unit. Provide factory power wiring from VFD's to the fan motors. Provide redundant VFD's with automatic switchover, factory mounted and wired. Provide copper wires, bus bars, and fittings throughout. Identify power supply terminals with permanent markers. The maximum temperature of terminals shall not exceed 167 degrees F when the equipment is tested in accordance with its rating. All wiring (460V, 120V and 24V) shall be in conduit. Separate terminal shall be provided for 120V power connection for service lights and convenience outlets. A separate 120V power source shall be coordinated with Division 26 –Electrical. Separate terminal shall be provided for 120V power connection for controls. A separate 120V power source shall be coordinated with Division 26 –Electrical.
- I. Unit mounted controls shall be installed by controls contractor. All end devices and control boards shall be provided by the temperature controls contractor. All wiring must be in conduit.
- J. Paint Finish: Exterior wall and roof panels shall be coated with polyurethane to a minimum dry thickness of 3 mils. Finish shall have no blistering or rusting on unscribed areas after 10,000 hours in accordance with ASTM B-117 salt fog test. Entire structural base shall be primer painted with industrial grade epoxy primer for total thickness of 4
- K. Furnish programmable digital thermostat/controller. Control shall be tied to existing EMS system.
- L. M. Special Features Options and Accessories
 - 1. Standard Integrated Economizer:
 - a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory installed option.
 - c. Damper blades shall be galvanized steel with metal gears. Plastic or composite blades on intake or return shall not be acceptable.
 - d. Damper blades shall be class 1A dampers.

- e. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
- f. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
- g. Economizer shall comply with, and be certified to, the AMCA 511 standard.
- h. Standard leak rate shall be equipped with dampers not to exceed 3 cfm/ft² leakage at 1 in. wg pressure differential.
- i. Economizer controller shall be the Johnson Controls SE Economizer Controller
 - 1) On board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, meets the requirements for California Title 24, IECC 2015, and ASHRAE 90.1.
 - 2) Sensor failure loss of communication identification
 - 3) Automatic sensor detection
 - 4) Capabilities for use with multiple speed indoor fan systems
 - 5) Utilize digital sensors: Dry bulb and Enthalpy
 - 6) UL, CSA, and ICES-003 recognized and FCC compliant to CFR47
- j. Shall be capable of introducing up to 100% outdoor air.
- k. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements. Barometric relief can be replaced by optional power exhaust.
- l. Shall be designed to close damper(s) during loss of power situations with spring return built into motor.
- m. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory installed only. Outdoor air sensor set point shall be adjustable and shall range from 40° to 80°F / 4° to 27°C. Additional sensor options shall be available as accessories.
- n. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
- o. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
- p. Dampers shall be completely closed when the unit is in the unoccupied mode.

- q. Economizer controller shall accept a 2 10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
- r. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
- s. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
- 2. Barometric Relief Kit
 - a. Shall contain all materials necessary to field install a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.
- 3. Manual Fresh Air Damper
 - a. Shall contain all materials necessary to field install a manual fresh air damper.
 - b. Shall include a slide-in damper assembly with an outdoor hood and filters.
 - c. Shall be available with either a range of 0%-100% outdoor air entry or 0%-35% outdoor air entry.
- 4. Motorized Damper
 - a. Damper shall be a Two Position Damper. Damper travel shall be from the full closed position to the field adjustable % open set point.
 - b. Damper shall include adjustable damper travel from 0% to 100% (full open).
 - c. Damper shall include single or dual blade, gear driven dampers and actuator motor.
 - d. Actuator shall be direct coupled to damper gear. No linkage arms or control rods shall be acceptable.
 - e. Damper will admit up to 100% outdoor air for applicable rooftop units.
 - f. Damper shall close upon indoor (evaporator) fan shutoff and/or loss of power.
 - g. The damper actuator shall plug into the rooftop unit's wiring harness plug. No hard wiring shall be required.
 - h. Outside air hood shall include aluminum water entrainment filter.
- 5. Manual damper

- a. Manual damper package shall consist of damper, air inlet screen, and rain hood which can be preset to admit up to 25 or 50% outdoor air for year round ventilation.
- 6. Unit Mounted, Non Fused Disconnect Switch:
 - a. Switch shall be factory installed, internally mounted.
 - b. National Electric Code (NEC) and UL approved non fused switch shall provide unit power shutoff.
 - c. Shall be accessible from outside the unit.
 - d. Shall provide local shutdown and lockout capability.
- 7. Convenience Outlet:
 - a. Powered convenience outlet.
 - 1) Outlet shall be powered from main line power to the rooftop unit.
 - 2) Outlet shall be factory installed and internally mounted with easily accessible 115 v female receptacle.
 - 3) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 4) Voltage required to operate convenience outlet shall be provided by a factory installed step down transformer.
 - 5) Outlet shall be accessible from outside the unit.
 - b. Non-Powered convenience outlet.
 - 1) Outlet shall be powered from a separate 115/120v power source.
 - 2) A transformer shall not be included.
 - 3) Outlet shall be factory installed and internally mounted with easily accessible 115 v female receptacle.
 - 4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 5) Outlet shall be accessible from outside the unit.
- 8. Propeller Power Exhaust:
 - a. Power exhaust shall be used in conjunction with an integrated economizer.

- b. Horizontal power exhaust shall be mounted in return ductwork.
- c. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0 100% adjustable set point on the economizer control.
- 9. Roof Curbs (Vertical):
 - a. Full perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.
 - b. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
 - c. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.
- 10. Low Ambient Kit
 - a. Shall contain an integrated low ambient controller to regulate condenser head pressure at low ambient temperatures by varying the amount of airflow through the condenser.
 - b. Shall allow units to operate in cooling mode down to 0° F outdoor ambient.
 - c. Shall be required when mechanical cooling is required at temperatures below 30° F.
- 11. Phase Monitor
 - a. Shall provide protection against phase reversal, phase loss, and phase unbalance.
 - b. Switch shall automatically shut off unit control circuit if any of the above conditions is detected.
 - c. Shall have visual LED indication of operational status.
- 12. Hinged and tool less access panels (factory installed)
 - a. Cabinet panels shall be hinged
 - b. Shall provide easy access with molded composite handles that are permanently attached and recessed into the panel.
 - c. Shall be on major panels of: filter, control box, fan motor, and compressor.

PART 3 - EXECUTION

3.01 FACTORY INSPECTIONS

- A. All work shall be subject to the Owner's inspection and approval at all times, but such approval does not relieve the AHU Manufacturer of responsibility for proper functioning of material and work. Notification shall be given to the AHU Manufacturer by the Owner, in writing, a minimum of 10 business days in advance of the visit.

3.02 FACTORY TESTING

- A. Factory testing shall be conducted at the AHU Manufacturer's facility prior to shipment of the units being tested. The Owner, engineer, and owner designated representative shall witness the tests. The AHU Manufacturer shall notify the Owner, in writing, a minimum of 10 business days in advance of the testing to provide time to coordinate travel arrangements. The AHU Manufacturer shall provide all equipment and trained personnel to conduct each test. Results shall be recorded and provided to the Owner and Engineer to review and approve prior to shipment.
- B. Costs for travel and lodging for the Owner, engineer, and his designated representative shall be covered by the AHU manufacture.
- C. Air Leakage Tests.
 - 1. The AHU Manufacturer shall conduct factory air leakage tests on units. Positive-pressure sections of units shall be tested under positive pressure and negative-pressure sections of units shall be tested under negative pressure. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
- D. Panel Deflection Test.
 - 1. The AHU Manufacturer shall conduct factory panel deflection tests on units. Positive-pressure sections of units shall be tested under positive pressure and negative-pressure sections of units shall be tested under negative pressure. Casing deflection shall not exceed $L/200$ at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.
- E. Factory Sound Test: Acoustical performance shall be provided based on AHRI Standard 260 fan in unit testing. Tests shall be in accordance to AMCA 320 for sound and AMCA 210 for airflow performance. Noise measurements shall be measured at the Inlet, Outlet and Casing Radiated positions.

- F. The AHU Manufacturer shall repair/replace at his own expense any items that fail or are damaged during testing. For any unit that fails testing, the AHU Manufacturer shall retest the unit until all items are in compliance with limits specified herein.
- G. After factory assembly, inspection and testing of units, the AHU Manufacturer shall disassemble each unit (where required) only to the extent necessary for shipment, unless otherwise detailed herein.
- H. The AHU Manufacturer shall legibly mark the parts of work to be erected or field-assembled to enable the Mechanical Contractor to identify the various parts and erect the work without delay.

3.03 SHIPPING

- A. Paper copies of the IOM shall also be shipped with each AHU.
- B. The AHU Manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU Manufacturer shall place them in containers.
- C. To protect equipment during shipment and delivery, all outdoor units shall be completely shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment.
- D. After loading the equipment for shipment, the AHU Manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.04 ON-SITE STORAGE

- A. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.05 LEVELING

- A. The Mechanical Contractor shall laser level all unit mounting surfaces, including housekeeping pads, roof curbs, and/or structural steel prior to rigging and installation of the AHU units. Should the AHU units be installed on an unlevel surface, the Mechanical Contractor shall rework the installation

at his/her own expense and to the satisfaction of the Owner and Engineer and to ensure proper installation.

3.06 FIELD EXAMINATION

- A. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.
- B. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.

3.07 INSTALLATION

- A. The Mechanical Contractor shall be responsible to coordinate ALL of his installation requirements with the Owner and the Owner's selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or -welded joints, and all other installation and assembly requirements.
- B. The AHU Manufacturer shall provide all screws and gaskets for joining of sections in the field.
- C. The AHU Manufacturer shall provide a factory-authorized service representative employed by the AHU Manufacturer to conduct a pre-installation inspection, provide rigging oversight, and supervise the AHU installation work provided by the Mechanical Contractor. The Mechanical Contractor shall obtain site readiness approval from the AHU Manufacturer prior to proceeding with rigging and installation of AHU units. The Mechanical Contractor shall repair or replace at his/her expense and to the satisfaction of the Owner and Engineer any misalignment or damage that occurs to the AHU units due to the Mechanical Contractor not following the guidance of the factory-authorized service representative employed by the AHU Manufacturer.
- D. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU Manufacturer's final inspection and start-up:
 - 1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
 - 2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.

3. All water and steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.
4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.
5. All power wiring, including motor starters and disconnects, serving the unit has been completed.
6. All automatic temperature and safety controls have been completed.
7. All dampers are fully operational.
8. All shipping materials have been removed.
9. All (clean) filter media has been installed in the units.

3.08 FINAL INSPECTION AND START-UP SERVICE

- A. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the factory-authorized service representative employed by the AHU Manufacturer shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.
- B. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start-up.
- C. Under the guidance and supervision of the factory-authorized service representative employed by the AHU Manufacturer the Mechanical Contractor, shall perform the following tests and services and submit a report outlining the results:
 1. Record date, time, and person(s) performing service.
 2. Lubricate all moving parts.
 3. Check all motor and starter power lugs and tighten as required.
 4. Verify all electrical power connections.
 5. Conduct a start-up inspection per the AHU Manufacturer's recommendations.
 6. Record fan motor voltage and amperage readings.

7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
8. Check fan for excessive vibration.
9. Check V-belt drive or coupling for proper alignment.
10. Check V-belt drive for proper tension. Tighten the belts in accordance with the AHU Manufacturer's directions. Check belt tension during the second and seventh day's operation and re-adjust belts, as may be required, to maintain proper tension as directed by the AHU Manufacturer.
11. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
12. Disengage all shipping fasteners on vibration isolation equipment.
13. Check safety guards to ensure they are properly secured.
14. Secure all access doors to the fan, the unit and the ductwork.
15. Switch electrical supply "on" and allow fan to reach full speed.
16. Physically check each fan at start-up and shut-down to ensure no abnormal or problem conditions exist.
17. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.
18. Check all control sequences.

3.09 NOISE AND VIBRATION

- A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.
- B. Corrective Measures: If specified noise and/or vibration levels are exceeded, provide necessary changes to reduce noise and/or vibration levels to within specified levels.

3.10 FIELD TESTS AND INSPECTION

- A. General: Perform field inspections, field tests, and trial operations as specified in Section 23 0500: Common Work Results for HVAC. Provide labor, equipment and incidentals required for testing. The Project Inspector will

witness field tests and trial operations as specified in Section 23 0500: Common Work Results for HVAC.

- B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at the place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.
- C. Start-Up and Operational Test: System shall be started up and initially operated with components operating. During this test, filters shall be periodically cleaned until no further accumulation of foreign material occurs. Adjust safety and automatic control instruments as required to provide proper operation and control sequence. Refer to Section 23 0500: Common Work Results for HVAC.
- D. Extent of Field Tests: After installation and before completion, Work of this Section shall be subjected to required field tests, including those specified here and in Section 23 0500: Common Work Results for HVAC.
- E. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 0500: Common Work Results for HVAC.

3.11 PROTECTION

- A. Protect the Work of this Section until Substantial Completion.

3.12 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION 23 70 00

PART 1 - GENERAL

1.1. SUMMARY

- A. Section includes: Air conditioning and air handling equipment including but not limited to:

1. Split System Custom Package Air Conditioning Units

1.2. RELATED DOCUMENTS:

- A. Drawings, Schedules, and General Provisions of the Contract apply to work of this section.

- B. Related Requirements:

1. Division 01: General Requirements
2. Section 07 60 00: Flashing and Sheet Metal
3. Section 22 10 00: Plumbing
4. Section 23 05 00: Common Work results for HVAC
5. Section 23 05 13: Basic HVAC Materials and Methods
6. Section 23 05 48: HVAC Sound, Vibration, and Seismic Control
7. Section 23 09 00: HVAC Instrumentation and Controls
8. Section 23 09 23: Environmental Control and Energy Management System
9. Section 23 30 00: Air Distribution

- C. Material standards shall be as specified or detailed hereinafter and as follows:

1. AMCA Publication 99 – Standards Handbook
2. AMCA Publication 311 – Certified Ratings Programme - Product Rating Manual For Fan Sound Performance.
3. AMCA Standard 300 – Reverberant Method for Sound Testing of Fans.
4. AMCA Standard 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
5. AMCA Standard 500-D – Laboratory Methods of Testing Dampers for Rating.
6. AMCA Standard 500-L – Laboratory Methods of Testing Louvers for Rating.

7. ANSI/ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings.
8. ANSI/ABMA 11 – Load Ratings and Fatigue Life for Roller Bearings.
9. ANSI/AMCA Standard 204 – Balance Quality and Vibration Levels for Fans.
10. ANSI/AMCA Standard 210 – Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
11. ANSI/AHRI Standard 1060 – Rating Air-to-Air Energy Recovery Ventilation Equipment.
12. ANSI/ASHRAE 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
13. ANSI/NEMA MG 1 – Motors and Generators.
14. AHRI Standard 260 – Sound Rating of Ducted Air Moving and Conditioning Equipment.
15. AHRI Standard 410 – Forced-Circulation Air-Cooling and Air-Heating Coils.
16. ASHRAE 52.1 – Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
17. ASHRAE 84 – Method of Testing Air-to-air Heat Exchangers.
18. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
19. ASTM E477 – Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.
20. NFPA 70 – National Electrical Code®.
21. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilation Systems.
22. UL 555S – Standard for Safety Smoke Dampers.
23. UL 900 – Standard for Safety Air Filter Units.
24. UL 1812 – Standard for Safety Ducted Heat Recovery Ventilators.
25. UL 1995 – Standard for Safety Heating and Cooling Equipment.

1.2 ABBREVIATIONS

1. ABMA – American Bearing Manufacturers Association.
2. AC – Alternating current.
3. AF – Air foil.

4. AHU – Air handling unit or fan coil unit.
5. AI – Analog input.
6. AMCA – Air Movement and Control Association International, Inc.
7. ANSI – American National Standards Institute.
8. AO – Analog output.
9. AHRI – Air-Conditioning, Heating, and Refrigeration Institute.
10. ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers.
11. ASTM – American Society for Testing and Materials.
12. BAS – Building automation system.
13. BC – Backward curved.
14. BI – Binary input.
15. BO – Binary output.
16. cfm – Cubic feet per minute.
17. dB – Decibels.
18. DDC – Direct digital controls.
19. DOP – Dioctyl phthalate aerosol.
20. DWDI – Double width, double inlet.
21. EATR – Exhaust air transfer rate.
22. EMT – Electrical metal tubing.
23. EPAct – Energy Policy Act.
24. ETL – Electrical Testing Laboratories.
25. FC – Forward curved.
26. FLA – Full load amps.
27. FM – Factory Mutual.
28. FMC – Flexible metal conduit
29. FOB – Freight on board.

- 30. fpm – Feet per minute.
- 31. GFCI – Ground fault circuit interrupter.
- 32. HEPA – High efficiency particulate air filter.
- 33. Hp – Horsepower.
- 34. Hz – Hertz.
- 35. IEC – International Electrotechnical Commission.
- 36. IFB - Integral face and bypass.
- 37. IOM – Installation, operation and maintenance manual.
- 38. IRI – Industrial Risk Insurers.
- 39. ISO – International Organization for Standardization.
- 40. kW – Kilowatts.
- 41. mA – Milliamps.
- 42. MCA – Minimum circuit ampacity.
- 43. MERV – Minimum efficiency report value.
- 44. MOP – Maximum overcurrent protection.
- 45. MPT – Male pipe thread.
- 46. NEC – National Electric Code.
- 47. NEMA – National Electrical Manufacturers Association.
- 48. NFPA – National Fire Protection Association.
- 49. NIST – National Institute of Standards and Technology.
- 50. OD – Outside diameter.
- 51. ODP – Open drip proof.
- 52. OSHA – Occupational Safety and Health Administration.
- 53. ppm – Parts per million.
- 54. psf – Pounds per square foot.
- 55. psig – Pounds per square in gage.

- 56. PWM – Pulse-width modulated.
- 57. RAM – Random access memory.
- 58. rpm – Revolutions per minute.
- 59. RTD – Resistive temperature detector.
- 60. SMACNA – Sheet Metal and Air-Conditioning Contractors' National Association.
- 61. SWSI – Single width, single inlet.
- 62. TEFC – Totally enclosed, fan cooled.
- 63. UL – Underwriters Laboratory.
- 64. V – Volts.
- 65. VAC – Volts alternating current.
- 66. VDC – Volts direct current.
- 67. VFD – Variable frequency drive.
- 68. W – Watts.
- 69. w.g. – Water gage.
- 70. °F – Degrees Fahrenheit.
- 71. ' – Feet.
- 72. " – Inches.

1.3 DEFINITIONS

- A. Hereinafter, a Class "A" thermal break shall be defined as a thermal break that ensures no member on the exterior of the unit, including fasteners, has through metal contact with any member on the interior of the unit, including fasteners.
- B. Hereinafter, wall assemblies shall include all unit wall panels around the air tunnel perimeter, all channels exposed to both the interior and exterior of the unit, and all removable wall access panels.
- C. Hereinafter, door assemblies shall include interior and exterior unit door panels, door frames, and door channels.
- D. Hereinafter, roof assemblies shall include exterior unit roof panels, interior unit ceiling panels, and all roof channels exposed to both the interior and exterior of the unit.

1.4 SCOPE OF WORK

- A. The AHU Manufacturer's work shall include, but is not necessarily limited to the following:
1. Furnish a complete set of submittals as described hereinafter.
 2. Provide AHUs fully factory assembled with the exception of unit splits as required for shipping or installation requirements as determined by the installing contractor. As shipped from the AHU Manufacturer, AHUs shall meet the performance requirements shown on the equipment schedule. Units shall be for outdoor application and shall have all components and options as indicated on the schedule or drawings. Furthermore, units shall be constructed as detailed hereinafter. Field-provide components and options shall be unacceptable unless otherwise noted.
 3. Provide all labor, materials, and equipment necessary for the complete engineering, production, factory assembly, factory testing, packaging, and delivery of the custom AHUs and their related equipment. Controls contractor to provide control end devices and unit controllers, for factory mounting and wiring.
 4. Permit the Owner and Engineer to inspect as herein described and to witness performance tests to ensure good product quality and compliance with these specifications.
 5. Factory test all AHUs as detailed herein and on the schedule.
 6. Provide a factory-authorized service representative employed by the AHU Manufacturer to supervise installation and start-up of the units as herein described.
 7. Provide Owner's Manual, complete operating instructions.
- B. Mechanical Contractor whose work will generally include the following:
1. Receive and unload the custom AHUs. Inspect the unit sections as they arrive on the job site. Notify the trucking company, AHU Manufacturer, and Owner of any shipping damage immediately.
 2. Coordinate all work associated with the AHU installation. Schedule with the AHU Manufacturer for a factory-authorized service person employed by the AHU Manufacturer to supervise unit installation. Clear area where unit is to be set of any construction materials or debris. Ensure equipment curbs or support platforms are level prior to setting the units. Hoist and set units in their proper position. Use spreader bars to hoist the unit (sections) to avoid damaging units. If units ship in multiple sections, provide all labor and equipment for placing and field joining sections.
 3. Provide all final chilled water, hot water, glycol water, steam, and drain piping connections. Release the fan spring isolator shipping restraints.

CUSTOM AIR HANDLING OUTDOOR EQUIPMENT

4. Remove all foreign objects and thoroughly clean the interior and exterior surfaces of the units with a mild detergent (soap and water). Do not use any abrasives or solvents without first consulting the AHU Manufacturer.
5. Install filter media in filter frames. Operating units without filter media is strictly prohibited.
6. Perform unit start up as detailed herein under the guidance and supervision of a factory-authorized service person employed by the AHU Manufacturer.

C. Electrical Contractor work will generally include the following:

1. Provide wiring between Owner's normal/emergency power source and the units.
2. Perform unit start up as detailed herein under the guidance and supervision of a factory-authorized service person employed by the AHU Manufacturer.

1.5. BID REQUIREMENTS

- A. The AHUs shall meet the performance criteria as indicated on the schedule and drawings.
- B. Base Bid AHU Manufacturers: Alliance (Basis of Design), PACE, Solutions.
- C. Naming of manufacturers does not imply that their standard construction is acceptable, nor does it imply that their products are automatically approved. A manufacturer who is not the basis of design is required, 14-days prior to bid, to submit to the mechanical engineer, proposed equipment, along with a comparison letter addressing each item in the specification and stating compliance with the specifications. This proposed submittal must be approved in writing by the mechanical engineer a minimum of 3- days prior to bid date. Approval will be at the discretion of the mechanical engineer. There shall be no exceptions to this requirement, and submittals of manufacturers who have not obtained written approval prior to bid will be rejected without review, and returned. The Mechanical Contractor shall be responsible for all additional costs incurred by the Engineer during the submittal and re-submittal phases for any contract awarded to a manufacturer not on the approved list.
- D. All AHU Manufacturer's that are not basis of design shall deliver selection data to the bid examiner. Selection shall include the following:
 1. Fan performance curves, coil performance, and unit discharge, inlet, and certified radiated sound power levels.
 2. Unit casing thermal performance at design supply air temperature graphed on a psychometric chart.
 3. A list of all exceptions and clarifications the AHU Manufacturer is taking to the specifications.

CUSTOM AIR HANDLING OUTDOOR EQUIPMENT

- E. To ensure injected closed-cell foam is properly engineered for rigidity and thermal performance, is amply applied to fill all cavities within each assembly, and is correctly cured to yield strong adhesion to casing members, the AHU Manufacturer shall have experience using injected closed-cell foam as an insulation in AHUs for no less than 5 years.
- F. Mechanical contractor shall carry full responsibility for any AH equipment that don't fit or don't meet the acoustical requirements of each designated area, at its own expense acoustical traps or leak test shall be done for any field modification.
- G. Contractor shall bare additional cost for new structural & acoustical calculations by using another listed brand.

1.6 SUBMITTALS

- A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Owner or Owner's approved representative.
- B. AHU Manufacturer shall provide the following information with each shop drawing/product data submission:
 - 1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, support locations, and weights. Drawings shall also indicate all electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations. Each component of the unit shall be identified and shall include physical dimensions and material of construction.
 - 2. Panel-to-panel joint and corner details and panel-to-roof details, all showing Class "A" thermal breaks.
 - 3. All performance data, including capacities and airside and waterside pressure drops, for components. AMCA-certified fan curves shall be provided with specified operating point clearly plotted. AMCA-certified sound power level data for fan inlet and outlet at fan rated capacity shall be provided. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, and 4000 Hz based on AHRI 260 fan in unit testing.
 - 4. Brand and model of fans, fan motors, coils, air filters, dampers, outside and return air measuring stations, and unit DDC controllers being furnished.
- C. The AHU Manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.

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- D. The AHU Manufacturer shall list any exceptions to the specification.

1.7 WARRANTY AND SERVICE

- A. AHU Manufacturer shall provide a parts & labor warranty extending 12 months from start-up or 18 months from shipment, whichever comes first.
- B. The AHU Manufacturer shall have a service department located within 50 miles of the job site, and 4 hour respond 24/7.
- C. Compressors shall be provided with manufacturer's 5-year warranty
- D. Manufacturer shall warrant parts, except heat exchangers, for a period of 5-years.
- E. Heat Exchangers shall be provided with manufacturer's

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Capacities of air conditioning equipment indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual project site environmental conditions.

2.2 MANUFACTURERS

- A. Basis of Design: Alliance

2.3 AGENCY LISTING

- A. AHUs shall be agency listed to UL 1995 by UL or ETL.

2.4 UNIT NAMEPLATES AND LABELS

- A. Metal nameplates shall be provided on the units. All information contained on the nameplate shall be etched or burned into the surface to prevent fading. Information shall include:
 - 1. Job name, sales order number, unit tagging, and service model number.
 - 2. MCA, MOP, and maximum fuse/HACR circuit breaker size.
 - 3. Voltage, frequency, phase, Hp, FLA, and inverter input current for all motors.
- B. Labels for AHRI Standard 410 and the listing agency, either UL or ETL, shall be provided on the units.
- C. Labels shall be provided on the units for unit rigging and coil piping and connection instructions. Labels shall be provided on fans indicating direction of

rotation. Warning labels shall be provided on appropriate components indicating hazardous voltage. For each section which must be assembled to another, matching steel identification tags shall be welded at each mating joint to ensure correct assembly order.

2.5 UNIT CONSTRUCTION

A. Casing Performance

1. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
2. Casing deflection shall not exceed $L/200$ at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.
3. Under scheduled supply air temperature and design conditions on the exterior of the unit of 79°F dry bulb and 68°F wet bulb, condensation shall not form on the casing exterior. The AHU Manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU Manufacturer shall provide, in writing, a guarantee against condensation forming on the unit exterior under the scheduled supply air temperature and design conditions on the exterior of the unit of 79°F dry bulb and 68°F wet bulb. The guarantee shall note that the AHU Manufacturer will cover all expenses associated with modifying units in the field should external condensate form on them. Copies of the guarantee shall be provided to the Engineer and the Owner.

4. IBC Seismic Certification

- a. All AHUs shall be certified for seismic applications in accordance with the following International Building Code (IBC) releases: IBC 2000, 2003, 2006, 2009.
- b. Seismic qualification testing and structural analysis shall be conducted in accordance with and strict adherence to the standards set forth within ASCE 7 by an independent approval agency with a complete list of certified models, options, and installation methods provided in an approved detailed report. The AHUs shall be approved for seismic applications when properly installed and used as intended. The basis of the certification shall be obtained through a combination of testing of the active and energized components per AC156, and analysis of the main force resisting members of the unit. Additional calculations shall be conducted to ensure components, accessories, and options remained intact and attached to the unit under seismic load conditions.

- c. The certification shall be based on a maximum Design Structural Response

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Acceleration at Short Period (Sds) value of 1.85 g's for IBC 2006 and 2009, and 1.93 g's for IBC 2000 and 2003. This is obtained from the Maximum Considered Earthquake Short Period Spectral Response Acceleration, Ss, of 2.78 g's or 2.90 g's as determined by the ASCE 7 seismic maps for Soil Site Class B with 5 percent damping. When the site soil properties or final equipment installation location are not known, the soil site coefficient, Fa, defaults to the Soil Site Class D coefficient. Occupancy Category IV and Seismic Design Category C shall be covered under this certification, limited by the Sds value stated above. A seismic importance factor, Ip, of 1.5 shall apply to the certification to include essential facility requirements and life safety applications for post event functionality.

- d. For IBC 2000 and 2003, $FP/WP = 0.4 \times 2/3(S_s=2.90) \times (F_A=1) \times (I_P=1.5) \times (a_P/RP=0.40) \times (1+2(z/h=1.0)) = 1.39 \text{ g's}$. For IBC 2006 and 2009 $FP/WP = 0.4 \times 2/3(S_s=2.78) \times (F_A=1) \times (I_P=1.5) \times (a_P/RP=0.42) \times (1+2(z/h=1.0)) = 1.39 \text{ g's}$
- e. Structural floors, housekeeping pads, supporting curbs, and supporting steel must be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads. Installation details such as special inspection, attachment to a curb, or attachment to a non-building structure must be outlined and approved by the Engineer of Record for the project or building. The installing contractor shall be responsible for the proper installation of the equipment and must observe the seismic installation requirements set forth by the Engineer of Record.

B. Bases & Floors

1. Base shall be construction from welded structural aluminum channels around the perimeter and welded structural aluminum cross members. Formed channels are not acceptable. The structural aluminum base shall be shot blasted, fully welded and then painted. The maximum cross-member spacing shall be 24" on center with members located adequately to support fan, coils, and other large components. The height of each base channel shall be no less than the height indicated in the drawings. Each shipping section shall be provided with removable lifting lugs. Structural framework shall fully support the unit casing and all components during installation such that no section deflects more than L/1000 during rigging of that section, where L is defined as the distance between lifting lugs.
2. AHU Floor shall be constructed from 0.063" aluminum safety tread plate surface. The floor surface shall be continuously welded with 2" turned up lip around the base perimeter and all floor penetrations. Caulk is not an acceptable sealing method for the floor. Floor drains shall be located in the floor to drain all sections. Floor drains shall be a minimum of 1.5" in diameter and shall be piped to the exterior of the unit base. Floor deflection shall not exceed L/200 under a point load of 200 pounds, where L is defined as the floor span. A 0.025" thick aluminum liner shall be attached to the underside of

the unit base and cross members, ensuring that the floor insulation is completely encapsulated.

3. Insulation that meets a minimum R-value of 12.5 shall be minimum 2" thick and shall be provided underneath the entire unit floor. Insulation shall be closed-cell foam to prevent wicking of moisture. Insulation shall completely fill the panel cavity in all directions so that no voids exist. Base assemblies shall comply with NFPA 90 A.
4. Safety grates that provide a walking surface shall be provided across all bottom air openings. Safety grates shall support a minimum 300-pound load. Safety grates shall be made of Type IWA welded rod with a cross flow pattern of 1.1875" x 4". Grating shall be aluminum construction for units with aluminum floors. Safety grates shall be removable to ensure adequate access to the ductwork below.

C. Walls

1. Wall assemblies shall be double-wall construction with 0.063" thick textured aluminum solid exterior and 0.025" thick smooth aluminum interior. The entire unit shall have a solid wall aluminum liner on the interior, except for the fan section, which shall have perforated wall liner. All spaces and joints of wall assemblies shall be completely sealed. Wall shall meet the casing deflection limits contained herein. Bolting of wall panels shall be 304 stainless on maximum 8" centers. Sheet metal or Tek fasteners are not acceptable for sealing pressure containing panels.
2. A Class "A" thermal break shall be provided throughout the entire wall assembly.
3. Insulation that meets a minimum R-value of 12.5 shall be minimum 2" thick with minimum 1.5 pound/cu.ft density, and shall be provided throughout all unit wall assemblies. Insulation shall be fiberglass and completely wrapped with long-strand fiberglass cloth to limit the entrainment of moisture into the insulation. The long-strand fiberglass cloth shall also incorporate an anti-microbial coating to suppress microbial growth. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Wall assemblies shall comply with NFPA 90 A.
4. Removable wall access panels shall be provided in coil and fan sections for service removal of components. A Class "A" thermal break shall be provided throughout all removal wall access panels.
5. Fan sections shall include 0.025" perforated aluminum interior sheet metal liners in fan blast area. Insulation in sections lined with perforated sheets shall be faced with neoprene.
6. Cooling coil and direct evaporative sections shall include 20 gauge 304 stainless steel liner.

7. All floor openings shall have 1" minimum flange up around entire perimeter.

D. Access Doors

1. Access doors shall be provided throughout units as indicated on the schedules and drawings. Access doors shall be double wall construction. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels, respectively.
2. A Class "A" thermal break shall be provided on all door assemblies downstream of the cooling coil.
3. Insulation that meets a minimum R-value of 12.5 shall be provided throughout all door assemblies. Insulation shall be injected foam. Foam shall be closed cell to prevent wicking of moisture. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Door assemblies shall comply with NFPA 90 A.
4. All doors shall be a minimum of 60" high if sufficient height is available, or the maximum height allowed by the unit height. All doors shall open against pressure to ensure an airtight seal and to prevent a safety hazard.
5. Door hinges shall be die-cast zinc with provision for adjustment without the use of shims or special tools. Door latches and handles are to be bolted to the unit and made with corrosion resistant materials. Bolts, nuts and shafts for door latches, handles and hinges shall be made of zinc plated steel. Door latch and pawl assembly shall be industrial quality and corrosion resistant with a handle on both the inside and outside of door. Latching mechanism shall be of conical roller design. Latch and pawl assembly shall be bolted together without the use of set screws.

All doors to fan sections shall be provided with latches which require a tool to open.

6. Windows shall be provided on doors in fan sections. Windows shall be mounted in a metal frame and shall be a minimum of 8" x 8", with wire-reinforced safety glass. For any instance where a window cannot fit in a door, a narrower window 8" tall may be provided. Windows in doors with a thermal break shall be thermal, double-pane type.

E. Roofs

1. Roof assemblies shall be double wall construction. Exterior roof panels and interior ceiling panels shall be of the same construction as the exterior and interior wall panels, respectively. Sections in units with perforated interior wall liners shall have perforated interior ceiling liners. For perforated liners, a triple-wall panel shall be provided. This triple-wall panel shall be constructed such that two layers of the panel are solid, with the afore-mentioned class of thermal break between them to isolate the supply air from contact with the outside panel. The third, inner liner shall be perforated. All spaces and joints of roof assemblies shall be completely sealed. In addition to meeting the casing

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deflection limits contained herein, roof deflection shall not exceed $L/200$ under a point load of 200 pounds, where L is defined as the roof panel span.

2. Outdoor unit roofs shall incorporate a standing seam on the exterior to ensure a rigid roof construction. Outdoor roofs shall be sloped, not less than 1/4" per foot for water drainage. Where outdoor units are shipped in multiple sections, provide standing-seam joiners at each split with adhesive, hardware, and cover strips for field joining by the installing contractor. On outdoor units, rain gutters shall be provided over all doors to direct rain away from the door assembly.

F. Shipping Splits

1. Shipping splits shall be provided as indicated on the schedule and drawings. Heavy-gage gussets shall be provided in the corners of each split on the unit interior to minimize the opportunity for racking of the section during shipping and rigging. Structural members shall be provided at the base of the unit exterior to enable pull together of each shipping split.

2.6 UNIT COMPONENTS

A. Dampers

1. Approved manufacturers: TAMCO, Ruskin.
2. Damper Sections: Dampers shall be low leakage type with airfoil blade design. All dampers shall carry the AMCA Standard 500 certification label. Air leakage through a 48" x 48" damper shall not exceed 10 CFM/ft².

Blade gasket shall be extruded EPDM elastomer secured in an integral slot within the aluminum extrusion. Frame seals shall be extruded TPE thermoplastic. Overlapping blade design shall compress seals to ensure tight seal on closure.

Damper frame shall be extruded aluminum with a thickness of not less than .080" and a depth of 4". Pivot rods shall be 7/16" hexagon extruded aluminum interlocking into blade section.

Bearings shall be double seal with an inner bearing fixed to the rod within a polycarbonate outer bearing inserted into the frame so that the outer bearing cannot rotate. Bearings shall be designed so that there is no metal to metal contact.

Linkage hardware shall be installed outside of the frame and constructed of corrosion resistant aluminum and zinc plated steel.

B. Air Filters

1. Approved manufacturers: Flanders, American Air filters, and Farr.
2. All filters shall be 12" x 24", 24" x 24", 24" x 20", or 20" x 20" nominal sizes to minimize the number of sizes required to be stocked by the Owner. Filters of other nominal sizes will not be acceptable.
3. Prefilters shall be minimum 2" thick, pleated disposable type. Prefilters shall be UL Class 2 when tested in accordance with UL Standard 900
4. Medium Efficiency mini Pleat Media Filters or rigid box filters
 - a. Pleated media filters 4" or 12" deep shall be provided as indicated on the schedule and drawings. The MERV 13 rating shall tested in accordance with ANSI/ASHRAE 52.2. Filter media shall be of non-woven fibers with metal grid support. Filters shall be provided with an anti-microbial coating. One set of extra filters shall be provided with each unit.
 - b. Filters shall be UL Class 2 when tested in accordance with UL Standard 900.
5. Filters shall be provided with front-loading frames. Filter holding frames shall be constructed of stainless steel and equipped with foam gaskets to seal filters against filter frames. Frame seams shall be sealed to eliminate air bypass. Front-loading frames shall be equipped with filter fasteners of the same material as the filter frame. Filter fasteners shall be capable of being installed without the use of special tools, bolts or nuts. Filter holding frames shall be of a universal type to accommodate standard filters of the same nominal size as well as appropriate fasteners. Filter access shall be as indicated on the schedule and drawings.
6. A Digihelic differential pressure gauge shall be provided factory installed for measuring the

pressure drop across each filter bank. The gauge shall be a diaphragm-actuated dial type, 4³/₄" O.D., with white dial, black figures and graduations and pointer zero adjustment.

C. Cooling and Heating Coils

1. Approved manufacturers: RAE, American Coil, Heatcraft, Luvata.
2. Coil performance shall be provided as indicated on the schedule and drawings. Coil capacities, pressure drops and selection procedures shall be certified to AHRI Standard 410.
3. Coils shall have same-end header connections. Connection locations (hanging) shall be as indicated on the drawings. Grommets shall be provided

at coil casing penetrations around the coil piping. Grommets shall be designed to seal the opening under positive and negative pressure.

4. DX Coils

- a. DX coil performance, circuiting, hot gas bypass line and piping layout shall be selected in accordance with the condenser unit requirements.
- b. Refrigerant shall be 410A or other Enviro-safe types.
- c. DX coils shall be provided as indicated on the schedule and drawings.
- d. DX coils shall have 0.006" thick copper fins. Fins shall be mechanically bonded to 3/8" OD seamless copper tubes with 0.020" thick walls. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion. All returns bends shall have a minimum wall thickness of 0.025" and shall be brazed and individually removable. Hairpin return bends are not allowed. Coils shall be circuitied for counter-flow heat transfer. Coil casings shall be constructed of stainless steel.

5. Primary Drain Pans

- a. Primary condensate drain pans shall be provided in cooling coil sections as detailed in the drawings. Drain pans in cooling coil sections shall be 304 stainless steel. Primary drain pans shall extend under each entire coil bank, including headers and return bends. Primary drain pans shall extend downstream of the coil bank for a minimum distance as indicated in the drawings. Primary drain pans shall be sloped a minimum of 1/8" per foot, shall be a minimum of 2" deep, and shall be double-sloped (sloped in 2 planes) to positively drain. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum of 1-1/2" beyond the base to ensure adequate room for field piping of condensate drain traps. Drain connection locations (handing) shall be as indicated on the schedule and drawings. Any coil support member located inside a primary drain pan shall be of the same material as the drain pan. Coil drain pans shall be supported by structural aluminum members under the floor.

6. Intermediate Drain Pans

- a. For cooling coil sections requiring stacked coils, sloped intermediate drain pans constructed of stainless steel shall be provided under each upper-level coil in the coil bank and shall extend under the entire coil, including headers and return bends. Intermediate drain pans shall extend downstream of the leaving face of the coil bank for a minimum of 4". Non-corrosive pipe with a minimum diameter of 1" shall be connected to each end of all intermediate drain pans, and shall be piped to the primary drain pan of the coil section. Any coil support member located inside an intermediate drain pan shall be of the same material as the drain pan.

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7. Steril-Aire UV Lights downstream of the coil mounted on Stainless steel racks and interlocked with the door for safety. Minimum intensity shall be 1225 $\mu\text{W}/\text{cm}^2$. Emitters and fixtures are to be installed in sufficient quantity and in such an arrangement so as to provide an equal distribution of UVC energy on coil and drain pan. Unit shall be high output, HVAC-type, germicidal UVC light source, factory assembled and tested. Component shall include a housing, reflector, high efficiency electronic power source, emitter sockets and tube, all constructed to withstand HVAC environments. Emitter tube shall be of the high output, hot cathode, T5 diameter, and medium bi-fin type. Intensity shall remain constant across a temperature range of 41-132°F.

D. Fans

1. Approved manufacturers: Pen Barry, Twin Cities, or equal.
2. Fan shall be SWSI Direct drive arrangement 4 as indicated on the schedule, minimum Class 2. Wheels are high efficiency, non-overloading type backward inclined airfoil blade design. Wheels contain 9 blades and are constructed from extruded aluminum. Fans shall be designed with reinforced steel inlet plate, structural steel frame, shaft, and bearings. Each fan assembly, including sheaves and belts, shall be trim balanced at the factory in accordance with ANSI 204-96 to Balance Quality Grade G6.3. Fans shall be rated in accordance with AMCA Standard 210 for air performance and AMCA 300 for sound. All fans shall carry the AMCA certification label
3. Fans shall be isolated with manual blank-offs to prevent backflow in the event of individual fan failure.
4. Nameplate motor horsepower for all fans, including dual fans, shall be at least 10% greater than design brake horsepower of each fan.
 - e. Motors shall be premium efficiency, NEMA Design B, TEFC, with Class B insulation. Minimum service factor shall be 1.15 and motors shall not be selected to operate in the service factor. Each fan/ fan array shall be provided with a VFD, as well as a redundant VFD with automatic switchover.
 - f. Aegis SGR motor bearing protection ring kit provided for each motor that is connected to a VFD. Protects motors from catastrophic failure and channels harmful VFD induced shaft currents to ground.
5. Fan Air Flow Measuring Stations: The flow measuring station shall consist of total pressure taps located in the inlet cone of each fan, with static pressure tap located near fan inlet panel. Any flow measuring device which creates an obstruction in the fan inlet is not acceptable. Provide a Dwyer magnehelic pressure gauge with CFM scale which indicates the fan volume. Flow gauges shall be calibrated to match the flow coefficient of the fan inlet cone provided.

Provide a DH3 Digihelic differential pressure switch for each fan. The transmitter shall be produce a 4 – 20 mA or 0 – 5 Vdc signal linear and

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- scaled to air volume or velocity. The transmitter shall be capable of withstanding over pressurization up to 200 times greater than span and shall be factory calibrated.
6. Fan Assembly Isolation Base: Fan and motor shall be mounted on an integral fully welded structural base. Base shall be free floating at all four corners on spring type isolators with earthquake restraints rated for Seismic Zone 4 requirements. Isolator spring deflection shall be 2" minimum or as indicated on specifications. Isolator supports shall be attached to base structural members, and welding to the floor skin is not acceptable.
- E. Service Lighting and Convenient Outlet: Guarded vapor proof marine lights factory wired to a single weatherproof switch located on exterior of cabinet. Provide weatherproof, 15 amps, GFCI receptacle near the light switch wired to the lighting circuit.
- F. Outside air intake
1. Provide air flow measuring station for outside air intake. Provide transmitter with digital readout and analog output for BMS.
 2. Either extruded aluminum louvers or weather hoods shall be used at outside air intake location. Louvers shall be stationary, wind driven rain resistant drainable type with built in downspouts and furnished with bird screen. Blades shall be vertical and housed inside an aluminum frame mounted to the unit exterior. Weather hoods shall be fabricated from aluminum and painted the same finish as unit exterior. Weather hood openings are lined with 1/2" galvanized mesh bird screen. Weather hoods are designed for 750 fpm maximum face velocity.
- H. Electrical Wiring: Provide single point power connection with a non-fused manual disconnect of the proper amp rating in the control cabinet for each air handling unit. Provide factory power wiring from VFD's to the fan motors. Provide redundant VFD's with automatic switchover, factory mounted and wired.
- Provide copper wires, bus bars, and fittings throughout. Identify power supply terminals with permanent markers. The maximum temperature of terminals shall not exceed 167 degrees F when the equipment is tested in accordance with its rating. All wiring (460V, 120V and 24V) shall be in conduit.
- Separate terminal shall be provided for 120V power connection for service lights and convenience outlets. A separate 120V power source shall be coordinated with Division 26 –Electrical.
- Separate terminal shall be provided for 120V power connection for controls. A separate 120V power source shall be coordinated with Division 26 –Electrical.
- I. Unit mounted controls shall be installed by controls contractor. All end devices and control boards shall be provided by the temperature controls contractor. All wiring must be in conduit.
- J. Paint Finish: Exterior wall and roof panels shall be coated with polyurethane to a

minimum dry thickness of 3 mils. Finish shall have no blistering or rusting on unscribed areas after 10,000 hours in accordance with ASTM B-117 salt fog test. Entire structural base shall be primer painted with industrial grade epoxy primer for total thickness of 4 mils minimum.

K. Low Ambient Operation: Head pressure control shall be provided for operation at outside air temperature below 45°F:

2.7 BUILDING MANAGEMENT SYSTEM DIAGNOSTIC POINTS

A. Diagnostic Points

1. Leaving Supply Air Temperature
2. Mixed Return Air Temperature
3. Outside Air Temperature
4. Space Temperature
5. Space CO2 Level (interlock w/ Demand Control Ventilation)
6. Fan Status
7. HP Compressor Status
8. Filter Status

B. Safeties

1. High Condensing Temperature protection.
2. Compressor motor current and temperature overload protection.
3. High Pressure relief.
4. Outdoor fan failure protection.

2.7 PARTS AVAILABILITY

A. Submit proof in writing that majority (minimum 80 percent) of replacements parts are commonly available and not proprietary. Also, submit proof in writing that a local parts sales and service facility exists, where replacement parts will be warehoused in quantity. Guarantee timely availability for parts that are proprietary.

PART 3 - EXECUTION

3.1 FACTORY INSPECTIONS

- A. All work shall be subject to the Owner's inspection and approval at all times, but such approval does not relieve the AHU Manufacturer of responsibility for proper functioning of material and work. Notification shall be given to the AHU

Manufacturer by the Owner, in writing, a minimum of 10 business days in advance of the visit.

3.2 FACTORY TESTING

- A. Factory testing shall be conducted at the AHU Manufacturer's facility prior to shipment of the units being tested. The Owner, engineer, and owner designated representative shall witness the tests. The AHU Manufacturer shall notify the Owner, in writing, a minimum of 10 business days in advance of the testing to provide time to coordinate travel arrangements. The AHU Manufacturer shall provide all equipment and trained personnel to conduct each test. Results shall be recorded and provided to the Owner and Engineer to review and approve prior to shipment.
- B. Costs for travel and lodging for the Owner, engineer, and his designated representative shall be covered by the AHU manufacture.
- C. Air Leakage Tests.
 - 1. The AHU Manufacturer shall conduct factory air leakage tests on units. Positive-pressure sections of units shall be tested under positive pressure and negative-pressure sections of units shall be tested under negative pressure. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
- D. Panel Deflection Test.
 - 1. The AHU Manufacturer shall conduct factory panel deflection tests on units. Positive-pressure sections of units shall be tested under positive pressure and negative-pressure sections of units shall be tested under negative pressure. Casing deflection shall not exceed L/200 at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.
- E. Factory Sound Test: Acoustical performance shall be provided based on AHRI Standard 260 fan in unit testing. Tests shall be in accordance to AMCA 320 for sound and AMCA 210 for airflow performance. Noise measurements shall be measured at the Inlet, Outlet and Casing Radiated positions.

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- F. The AHU Manufacturer shall repair/replace at his own expense any items that fail or are damaged during testing. For any unit that fails testing, the AHU Manufacturer shall retest the unit until all items are in compliance with limits specified herein.
- G. After factory assembly, inspection and testing of units, the AHU Manufacturer shall disassemble each unit (where required) only to the extent necessary for shipment, unless otherwise detailed herein.
- H. The AHU Manufacturer shall legibly mark the parts of work to be erected or field-assembled to enable the Mechanical Contractor to identify the various parts and erect the work without delay.

3.3 SHIPPING

- A. Paper copies of the IOM shall also be shipped with each AHU.
- B. The AHU Manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU Manufacturer shall place them in containers.

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- C. To protect equipment during shipment and delivery, all outdoor units shall be completely shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment.
- D. After loading the equipment for shipment, the AHU Manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.4 ON-SITE STORAGE

- A. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.5 LEVELING

- A. The Mechanical Contractor shall laser level all unit mounting surfaces, including housekeeping pads, roof curbs, and/or structural steel prior to rigging and installation of the AHU units. Should the AHU units be installed on an unlevel surface, the Mechanical Contractor shall rework the installation at his/her own expense and to the satisfaction of the Owner and Engineer and to ensure proper installation.

3.6 FIELD EXAMINATION

- A. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.
- B. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.

3.7 INSTALLATION

- A. The Mechanical Contractor shall be responsible to coordinate ALL of his installation requirements with the Owner and the Owner's selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or -welded joints, and all other installation and assembly requirements.
- B. The AHU Manufacturer shall provide all screws and gaskets for joining of sections in the field.
- C. The AHU Manufacturer shall provide a factory-authorized service representative employed by the AHU Manufacturer to conduct a pre-installation inspection, provide rigging oversight, and supervise the AHU installation work provided by

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the Mechanical Contractor. The Mechanical Contractor shall obtain site readiness approval from the AHU Manufacturer prior to proceeding with rigging and installation of AHU units. The Mechanical Contractor shall repair or replace at his/her expense and to the satisfaction of the Owner and Engineer any misalignment or damage that occurs to the AHU units due to the Mechanical Contractor not following the guidance of the factory-authorized service representative employed by the AHU Manufacturer.

- D. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU Manufacturer's final inspection and start-up:
1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
 2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.
 3. All water and steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.
 4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.
 5. All power wiring, including motor starters and disconnects, serving the unit has been completed.
 6. All automatic temperature and safety controls have been completed.
 7. All dampers are fully operational.
 8. All shipping materials have been removed.
 9. All (clean) filter media has been installed in the units.

3.8 FINAL INSPECTION AND START-UP SERVICE

- A. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the factory-authorized service representative employed by the AHU Manufacturer shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.
- B. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start-up.
- C. Under the guidance and supervision of the factory-authorized service representative employed by the AHU Manufacturer the Mechanical Contractor,

shall perform the following tests and services and submit a report outlining the results:

1. Record date, time, and person(s) performing service.
2. Lubricate all moving parts.
3. Check all motor and starter power lugs and tighten as required.
4. Verify all electrical power connections.
5. Conduct a start-up inspection per the AHU Manufacturer's recommendations.
6. Record fan motor voltage and amperage readings.
7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
8. Check fan for excessive vibration.
9. Check V-belt drive or coupling for proper alignment.
10. Check V-belt drive for proper tension. Tighten the belts in accordance with the AHU Manufacturer's directions. Check belt tension during the second and seventh day's operation and re-adjust belts, as may be required, to maintain proper tension as directed by the AHU Manufacturer.
11. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
12. Disengage all shipping fasteners on vibration isolation equipment.
13. Check safety guards to ensure they are properly secured.
14. Secure all access doors to the fan, the unit and the ductwork.
15. Switch electrical supply "on" and allow fan to reach full speed.
16. Physically check each fan at start-up and shut-down to ensure no abnormal or problem conditions exist.
17. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.
18. Check all control sequences.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: Floor and wall mounted heat pumps.
- B. Related Requirements:
 - 1. Division 01: General Requirements.
 - 2. Division 26: Electrical.
 - 3. Section 07 2100: Thermal Insulation.
 - 4. Section 22 1000: Plumbing.
 - 5. Section 23 0500: Common Work Results for HVAC.
 - 6. Section 23 0513: Basic HVAC Materials and Methods.
 - 7. Section 23 0548: HVAC Sound, Vibration and Seismic Control.
 - 8. Section 23 0900: HVAC Instrumentation and Controls.
 - 9. Section 23 0923: Environmental Control and Energy Management Systems.
 - 10. Section 23 2013: HVAC Piping.
 - 11. Section 23 3000: Air Distribution.

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

1.03 QUALITY ASSURANCE

- A. Design, construction, testing and installation shall comply with the following standards as applicable:
 - 1. UL or ETL.
 - 2. ANSI/AHRI Standard 390.
 - 3. ASHRAE/IESNA 90.1.
 - 4. ASHRAE 62.1

1.04 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 0500: Common Work Results for HVAC.

1.05 WARRANTY

- A. Compressors shall carry unconditional five year warranty.

PART 2 – PRODUCTS

2.01 EQUIPMENT

- A. Capacities of heat pumps as indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual Project site environmental conditions.
- B. Description: Low noise, high efficiency, single packaged, indoor, floor mounted heat pump unit.

1. Sound Level: The unit shall operate at full load conditions with a maximum sound level of 45 dBA measured at five feet in front of the unit and five feet above the floor.

2. Energy Efficiency: Minimum 10.6 EER.

2.02 OUTDOOR SPLIT SYSTEM HEAT PUMPS

A. GENERAL

1. Outdoor, rooftop or slab mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic, suction gas cooled, direct drive compressor(s) for cooling duty and nickel chromium elements for heating duty.

2. Factory assembled, single- piece outdoor condensing unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start- up.

3. Unit shall use environmentally sound, R-410A refrigerant.

4. Unit shall be installed in accordance with the manufacturer's instructions.

5. Unit must be selected and installed in compliance with local, state, and federal codes.

B. Quality Assurance

1. Unit meets ASHRAE 90.1 minimum efficiency requirements.

2. Unit shall be rated in accordance with AHRI Standards 210/240 or 340/360.

3. Unit shall be designed to conform to ASHRAE 15
4. Unit shall be UL- tested and certified in accordance with ANSI Z21.47 - 2012/CSA 2.3-2012, CSA C22.2 No. 236-11 (UL 1995) 4th edition and CSA C22.2 No. 3 - M 1988.
5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. Unit casing shall be capable of withstanding 750- hour salt spray exposure per ASTM B117 (scribed specimen).
7. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
8. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
9. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box
10. Unit shake tested to Truck 2, ASTM D4169 to ensure shipping reliability.

C. Delivery, Storage, and Handling

1. Unit shall be stored and handled per manufacturer's recommendations.
2. Overhead crane can be used to place the units on a roof using rigging holes built into the unit base rails without any additions to the unit.
3. Unit shall only be stored or positioned in the upright position.

D. Project Conditions

1. As specified in the contract.

E. Operating Conditions

1. Unit shall be capable of starting and running at 125°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at □□10% voltage.
2. Compressor with standard controls shall be capable of operation down to 30°F (-1°C), ambient outdoor temperatures. Optional low ambient kit is available if mechanically cooling at ambient temperatures below 30°F (-1°C).

F. Electrical Requirements

1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.

G. Unit Cabinet

1. Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 3.0 MILS minimum, gloss (per ASTM D523, 60°F / 16°C): 80+/-5, Hardness: H- 2H Pencil hardness.
3. Unit cabinet shall have gas and electric utility knockouts in the side of the unit and in the unit underside. Base of unit shall have a minimum of four locations for through-the- base electrical connections standard.
4. Base Rail
 - a. Unit shall have base rails on a minimum of 4 sides.
 - b. Base rail mounted lifting lugs shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
 - c. Base rail shall be a minimum of 15 gauge thickness.
5. Top panel:
 - a. Shall be a multi piece top panel.
6. Electrical Connections
 - a. All unit power wiring shall enter unit cabinet at a single, factory prepared, and knockout location.
 - b. Through- the- base capability.
 - 1) Standard unit shall have a through- the- base electrical location(s) using a raised, embossed portion of the unit base-pan.
 - 2) Optional, factory approved, water- tight connection method must be used for through- the- base electrical connections.
 - 3) No base-pan penetration, other than those authorized by the manufacturer, is permitted.
7. Units shall meet the wind load requirements under Florida Building Code 2017 as per ASCE 7-16.
 - a. Units are certified with wind resistance ratings of 186 MPH as certified by independent structural engineers.

I. K. Coils

1. Outdoor Coils:

- a. Standard condensing units shall have aluminum Microchannel coils. Standard heat pumps shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
- b. Shall be leak tested to 150 psig, pressure tested to 250 psig, and qualified to CSA C22.2 No. 236-11 (UL 1995) 4th edition burst test at 1775 psig.
- c. Assembled unit shall be pressure tested to 450 psig.

J. Refrigerant Circuits

- 1. Standard Efficiency AC shall utilize 2 independent refrigerant circuits.
- 2. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
 - b. Refrigerant filter drier - Solid core design.
 - c. Service gauge connections on suction and discharge lines.
- 3. Compressors
 - a. Unit shall use fully hermetic scroll compressors for each independent refrigeration circuit.
 - b. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
 - c. Compressors shall be internally protected from high discharge temperature conditions.
 - d. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.
 - e. Compressor shall be factory mounted on rubber grommets.
 - f. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.
 - g. Crankcase heaters shall be installed in the factory for all necessary applications.

K. Condenser Fans and Motors

- 1. Condenser fan motors:
 - a. Shall be a totally enclosed motor.
 - b. Shall use permanently lubricated ball-bearings.
 - c. Shall have inherent thermal overload protection with an automatic reset feature.
 - d. Shall use a shaft-up design.
- 2. Condenser Fans:

- a. Shall be a direct- driven propeller type fan.
- b. Shall have aluminum blades riveted to corrosion- resistant steel spider brackets and be dynamically balanced.

L. Special Features, Options, and Accessories

1. Unit- Mounted, Non- Fused Disconnect Switch:

- a. Switch shall be factory installed, internally mounted.
- b. National Electric Code (NEC) and UL approved non- fused switch shall provide unit power shutoff.
- c. Shall be accessible from outside the unit.
- d. Shall provide local shutdown and lockout capability.

2. Convenience Outlet:

- a. Powered convenience outlet.
 - 1) Outlet shall be powered from main line power to the rooftop unit.
 - 2) Outlet shall be factory installed and internally mounted with easily accessible 115- v female receptacle.
 - 3) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 4) Voltage required to operate convenience outlet shall be provided by a factory installed step- down transformer.
 - 5) Outlet shall be accessible from outside the unit.
- b. Non- Powered convenience outlet.
 - 1) Outlet shall be powered from a separate 115/120v power source.
 - 2) A transformer shall not be included.
 - 3) Outlet shall be factory installed and internally mounted with easily accessible 115- v female receptacle.
 - 4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 5) Outlet shall be accessible from outside the unit.

3. Low Ambient Kit

a. Shall contain an integrated low ambient controller to regulate condenser head pressure at low ambient temperatures by varying the amount of airflow through the condenser.

b. Shall allow units to operate in cooling mode down to 0° F outdoor ambient.

c. Shall be required when mechanical cooling is required at temperatures below 25° F.

4. Reversing DX Valve

a. Provide reversing valve, suction line accumulator, second expansion valve and defrost timer for heat pump operation.

L. Instrumentation and Control Devices for HVAC

1. Thermostats must

a. Energize "Y" when calling for cooling and "W" when calling for heating.

b. Standard Efficiency AC units, shall have capability to energize 2 different stages of cooling, and 2 different stages of heating.

c. For High Efficiency AC units, shall have capability to energize 2 different stages of cooling and 2 different stages of heating.

d. Shall include capability for occupancy scheduling.

M. Direct-Digital Control system for HVAC

1. Shall be ASHRAE 62 compliant.

2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.

3. Shall have an operating temperature range from -40°F to 158°F; 10-90% RH (non-condensing UI), and -4°F to 158°F; 10-90% RH (non-condensing), with a storage temperature range from -40°F to 194°F; 5-95% RH (non-condensing).

4. Shall include an option of an Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary outputs.

5. Controller shall accept the following inputs: space temperature, return air temperature sensor, set point adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock-out, fire/smoke shutdown, single and dual enthalpy, fan status, remote time clock, Sensor Actuator (SA) Bus communicated temperature/humidity/CO2 values from Network sensors, Field Controller (FC) Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.

6. Shall accept a CO2 sensor or multiple CO2 sensors networked together in the conditioned space, and be Demand Control Ventilation (DCV) ready.
7. Shall provide compressor short-cycle protection with minimum compressor runtime set at 5 minutes standard and adjustable from 2 to 7 minutes.
8. Built in lead-lag compressor sequencing to support balanced utilization of refrigerant circuits
9. Shall provide the following outputs: economizer, fan, cooling stage 1, 2. 2 heat stage 1, heat stage 2 , heat stage/ exhaust/ reversing valve/ occupied.
10. Unit shall provide surge protection for the controller through a circuit breaker.
11. Shall have open communication protocols with all required points exposed. Protocols supported include: BACnet®, MS/TP, Modbus®, and N2 communication.
12. Shall have an LCD display on the Unit Control Board to display fault messages as well as navigate the menu structure to review and change set points.
13. Shall utilize a USB connection to allow for uploading and downloading of data.
 - a. USB shall allow for downloading of "trending data" for analysis of inputs and values on other device such as a PC.
 - b. USB shall allow for uploading of new firmware to the UCB.
 - c. USB shall allow for backing up controller set points and parameters and for uploading of these same parameters to the UCB.
14. Shall include an RJ-12 port to be used with a Wi-Fi signal transmitting device and allow unit(s) access via any non-proprietary smart device.
 - a. Unit access shall include ability to view and change all adjustable parameters and set points using the same characteristics and values available directly through the UCB joystick and LCD display.
 - b. Unit access shall be configurable at 3 different levels to allow control over parameter and set point changes.
 - c. Wi-Fi transmitting device can be connected by 3 means.
 - 1) RJ-12 port connected directly to UCB.
 - 2) Optional connection port mounted in operating space.
 - 3) Optional connection to building network allowing unit access from any internet browser worldwide.
15. Shall have the capability to integrate with the Verasys® zoning system.

16. Shall not require any proprietary software or contractor tool to start-up, commission and troubleshoot unit operation.
17. Software upgrades will be accomplished by local download via USB port on main Unit Control Board.
18. Shall be UL Recognized, File E107041, UL 916, Energy management Equipment, UL 1995, Heating and Cooling Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class B, CSA 22.2 No. 236, Signal Equipment Industry Canada, ICES-003 Recognized, and BTL certified.

M. Electric and Electronic Control system for HVAC (Decentralized, outdoor Condensing Units

1. Shall be complete with self- contained low- voltage control circuit protected by a resettable circuit breaker on the 24- v transformer side. Transformer shall have 150VA capability.
 2. Shall utilize color- coded wiring.
 3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
- 23 09 33.23.B.Safeties:
1. Compressor over- temperature, over- current. High internal pressure differential.
 2. Low pressure switch and high pressure switch
 - a. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
 3. Automatic reset, motor thermal overload protector.
 4. Heating section shall be provided with the following minimum protections:
 - a. High temperature limit switches.

2.03

PART 3 – EXECUTION

3.01 GENERAL

- A. Examine areas under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 EQUIPMENT FOUNDATIONS

- A. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Equipment foundations shall be of sufficient size and weight, and of proper design to preclude shifting of equipment under operating conditions, or under any abnormal conditions imposed upon equipment.
- B. Foundations shall meet requirements of equipment manufacturer and, when required by Architect, obtain from equipment manufacturer, approval of foundation design and construction, for equipment to be installed. Equipment vibration shall be maintained within design limits, and shall be dampened and isolated. Isolators shall be bolted to a structural member so as to be readily removable.

3.03 EQUIPMENT DESIGN AND INSTALLATION

- A. Uniformity: Unless otherwise specified, equipment of same type or classification shall be product of same manufacturer.
- B. Application: Only provide equipment as reviewed by Architect.
- C. Equipment Installation: Equipment installation shall be in strict accordance with these Specifications, and installation instructions of manufacturers. Equipment installed on concrete foundations shall be grouted before piping is installed. Piping shall be installed in such a manner as not to place a strain on any of equipment. Flanged joints shall be adequately extended before installation. Piping shall be graded, anchored, guided and supported, without low pockets.
 - 1. Install equipment in a neat and skillful manner, properly aligned, leveled, and adjusted for satisfactory operation.
 - 2. Install so connecting and disconnecting of piping and accessories can be readily accomplished, parts are readily accessible for inspection, service and repair. Space shall be provided to readily remove filters, coils, compressors and fan wheels. Access doors shall be hinged with cam lock door handles.
 - 3. Provide flexible connections for duct, pipe and conduit connections at moving equipment.

3.04 NOISE AND VIBRATION

- A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.
- B. Corrective Measures: If specified noise and/or vibration levels are exceeded, the installing HVAC contractor must provide necessary changes to reduce noise and/or vibration levels to within specified levels.

3.05 FIELD TESTS AND INSPECTION

- A. General: Perform field inspections, field tests, and trial operations as specified in Section 23 0500: Common Work Results for HVAC. Provide labor, equipment and incidentals required for testing. The Project Inspector will witness field tests and trial operations as specified in Section 23 0500: Common Work Results for HVAC.
- B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.
- C. Extent of Field Tests: After installation and before completion, Work of this Section shall be subjected to required field tests, including those specified here and in Section 23 0500: Common Work Results for HVAC.
 - 1. TAB (Test and Balance) and sound level measurement according to SMACNA and ANSI Standard S12.6, respectively, will be performed by a District approved agency. Noise level generated by the HVAC unit measured 5 feet from the unit shall not exceed 45 dBA.
- D. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 0500: Common Work Results for HVAC.

3.06 CONDENSATE DRAIN LINE PIPING

- A. Sleeve penetrations of floors, walls and ceiling to allow for free motion of piping. Provide type L copper pipe and 24 gage chrome-plated escutcheon plates. Pack annular space between pipe and sleeve with incombustible material such as fiberglass and seal each end with mastic to provide a waterproof seal.

3.07 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.08 PROTECTION

- A. Protect Work of this Section until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.03 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
 - 2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
 - 3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.04 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Hot-gas bypass valves.
 - 4. Filter dryers.
 - 5. Strainers.
- B. Welding certificates.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.06 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.07 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.01 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88M, Type A or B).
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
 - 5. Maximum Operating Temperature: 250 deg F (121 deg C).
- G. Check Valves:
 - 1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 - 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 - 3. Piston: Removable polytetrafluoroethylene seat.
 - 4. Closing Spring: Stainless steel.
 - 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 - 6. End Connections: Socket, union, threaded, or flanged.
 - 7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
 - 8. Working Pressure Rating: 500 psig (3450 kPa).
 - 9. Maximum Operating Temperature: 275 deg F (135 deg C).

- H. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
 2. Core: Removable ball-type check valve with stainless-steel spring.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Copper spring.
 5. Working Pressure Rating: 500 psig (3450 kPa).
- I. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24 or 115-V ac coil.
 6. Working Pressure Rating: 400 psig (2760 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
 8. Manual operator.
- J. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 400 psig (2760 kPa).
 6. Maximum Operating Temperature: 240 deg F (116 deg C).
- K. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F (4.4 deg C)
 6. Superheat: Adjustable.

7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 700 psig (4820 kPa).
- L. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 5. Seat: Polytetrafluoroethylene.
 6. Equalizer: External.
 7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.
 8. End Connections: Socket.
 9. Set Pressure: Jamet.
 10. Throttling Range: Maximum 5 psig (34 kPa).
 11. Working Pressure Rating: 500 psig (3450 kPa).
 12. Maximum Operating Temperature: 240 deg F (116 deg C).
- M. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
 2. Screen: 100-mesh stainless steel.
 3. End Connections: Socket or flare.
 4. Working Pressure Rating: 500 psig (3450 kPa).
 5. Maximum Operating Temperature: 275 deg F (135 deg C).
- N. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
 2. Drain Plug: Brass hex plug.
 3. Screen: 100-mesh monel.
 4. End Connections: Socket or flare.
 5. Working Pressure Rating: 500 psig (3450 kPa).
 6. Maximum Operating Temperature: 275 deg F (135 deg C).
- O. Moisture/Liquid Indicators:
1. Body: Forged brass.

2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
 3. Indicator: Color coded to show moisture content in ppm.
 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
 5. End Connections: Socket or flare.
 6. Working Pressure Rating: 500 psig (3450 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
- P. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated charcoal.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig (14 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 240 deg F (116 deg C).
- Q. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated charcoal
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig (14 kPa).
 8. Working Pressure Rating: 500 psig (3450 kPa).
 9. Maximum Operating Temperature: 240 deg F (116 deg C).
- R. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or flare.

3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).
- S. Receivers: Comply with ARI 495.
 1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
 2. Comply with UL 207; listed and labeled by an NRTL.
 3. Body: Welded steel with corrosion-resistant coating.
 4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
 5. End Connections: Socket or threaded.
 6. Working Pressure Rating: 500 psig (3450 kPa).
 7. Maximum Operating Temperature: 275 deg F (135 deg C).
- T. Liquid Accumulators: Comply with ARI 495.
 1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or threaded.
 3. Working Pressure Rating: 500 psig (3450 kPa).
 4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.02 REFRIGERANTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
- C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Section 23 0923 "Environmental Control and Energy Management Systems" for solenoid valve controllers and control wiring.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
 - 1. Shot blast the interior of piping.
 - 2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.

3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
 4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
 5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
 6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.
- R. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
 - S. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."
 - T. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
 - U. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
 - V. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.
 - W. Identify refrigerant piping and valves according to Division 15 Section "Identification for HVAC Piping and Equipment."

3.02 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
- H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- 3.03 HANGERS AND SUPPORTS
- A. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
 2. Spring Hangers to support vertical runs.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 2. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
- 3.04 FIELD QUALITY CONTROL
- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
1. Comply with ASME B31.5, Chapter VI.
 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.

- c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
- d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.05 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
 - 4. Charge system with a new filter-dryer core in charging line.

3.06 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common electrical installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So, connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel..
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc

- B. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
- C. Pressure Plates: Carbon steel. Include two for each sealing element.
 - a. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
- I. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 26 05 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.
- B. Related Sections include the following:
 - 1. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized

testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Alcan Products Corporation; Alcan Cable Division.
 2. American Insulated Wire Corp.; a Leviton Company.
 3. General Cable Corporation.
 4. Senator Wire & Cable Company.
 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. O-Z/Gedney; EGS Electrical Group LLC.

4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.
- F. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- I. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.
- J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- K. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- L. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
 - 1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
 - 2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both wall surfaces.
- G. Extend sleeves installed in floors 2 inches above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

3.9 Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

- A. Perform tests and inspections and prepare test reports.

- B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

- C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 05 19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Multimode optical-fiber cabling.
 - 2. UTP cabling.
 - 3. RS-485 cabling.
 - 4. Low-voltage control cabling.
 - 5. Control-circuit conductors.
 - 6. Identification products.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- C. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.
- D. RCDD: Registered Communications Distribution Designer.
- E. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PERFORMANCE REQUIREMENTS

- A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
 - 1. Flame Travel Distance: 60 inches or less.
 - 2. Peak Optical Smoke Density: 0.5 or less.
 - 3. Average Optical Smoke Density: 0.15 or less.
- B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.3 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."
- B. Painting: Paint plywood on all sides and edges with flat latex paint.

2.4 OPTICAL-FIBER CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Belden Inc.
 - 2. CommScope, Inc.
 - 3. Corning Incorporated.
 - 4. Emerson Connectivity Solutions.
 - 5. General Cable Technologies Corporation.
 - 6. 3M.
 - 7. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Description: Multimode, 50/125-micrometer, 24-fiber, nonconductive, tight-buffer, optical-fiber cable.
 - 1. Comply with ICEA S-83-596 for mechanical properties.
 - 2. Comply with TIA-568-C.3 for performance specifications.
 - 3. Comply with TIA-492AAAA-B for detailed specifications.
 - a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
 - b. Riser Rated, Nonconductive: Type OFNR or Type OFNP, complying with UL 1666.
 - c. Riser Rated, Nonconductive: Type OFNP or Type OFNR in listed riser or plenum communications raceway.
 - d. Riser Rated, Nonconductive: Type OFN, Type OFNG, Type OFNP, or Type OFNR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - e. General Purpose, Nonconductive: Type OFN, Type OFNG, Type OFNP, or Type OFNR in metallic conduit.
 - f. Plenum Rated, Conductive: Type OFC, Type OFN, Type OFCG, Type OFNG, Type OFCP, Type OFNP, Type OFCR, or Type OFNR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - g. Riser Rated, Conductive: Type OFC, Type OFN, Type OFCG, Type OFNG, Type OFCP, Type OFNP, Type OFCR, or Type OFNR in metallic conduit.

- h. General Purpose, Conductive: Type OFC, Type OFN, Type OFCG, Type OFNG, Type OFCP, Type OFNP, Type OFCR, or Type OFNR in metallic conduit.
 - 4. Conductive cable shall be aluminum-armored type.
 - 5. Maximum Attenuation: 3.5 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
 - 6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- C. Jacket:
- 1. Jacket Color: Aqua for 50/125-micrometer cable.
 - 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
 - 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.5 OPTICAL-FIBER CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- 1. Belden Inc.
 - 2. Corning Incorporated.
 - 3. Dynacom Inc.
 - 4. Hubbell Incorporated.
 - 5. Panduit Corp.
 - 6. Siemon Company (The).
- B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
- 1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.
- D. Cable Connecting Hardware:
- 1. Comply with Optical-Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA-568-C.3.
 - 2. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss of not more than 0.75 dB.
 - 3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.6 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Alpha Wire Company; a division of Belden Inc.
 2. Belden Inc.
 3. CommScope, Inc.
 4. 3M.
 5. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Description: 100-ohm, four-pair UTP, 25-pair UTP covered with a thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties of Category 5e cables.
 2. Comply with ICEA S-102-700 for mechanical properties of Category 6 cables.
 3. Comply with TIA-568-C.1 for performance specifications.
 4. Comply with TIA-568-C.2, Category 6.
 5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with NEMA WC 66, UL 444 and NFPA 70 for the following types:
 - a. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - b. Communications, Riser Rated: Type CMP or Type CMR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - c. Communications, General Purpose: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - d. Communications, Limited Purpose: Type CMX; or Type CM, Type CMG, Type CMP, or Type CMR.

2.7 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Belden Inc.
 2. Dynacom Inc.
 3. Hubbell Incorporated.

4. Leviton Commercial Networks Division.
 5. Panduit Corp.
 6. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
1. Number of Jacks per Field: One for each four-pair UTP cable indicated.
- F. Jacks and Jack Assemblies: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C.1.
- G. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
- H. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.
- I. Faceplates:
1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
 2. Metal Faceplate: Brass, complying with requirements in Section 262726 "Wiring Devices."
 3. For use with snap-in jacks accommodating any combination of UTP, optical-fiber, and coaxial work area cords.
 - a. Flush-mounted jacks, positioning the cord at a 45-degree angle.

J. Legend:

1. Factory labeled by silk-screening or engraving for brass faceplates.

2.8 TWIN-AXIAL DATA HIGHWAY CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 4 pairs, No. 22 AWG, stranded (7x28) tinned-copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with UL 1685.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 4 pairs, No. 22 AWG, stranded (7x28) tinned-copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.9 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CMG.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262.

2.10 LOW-VOLTAGE CONTROL CABLE

- A. Paired Cable: NFPA 70, Type CMG.
 - 1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with UL 1685.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - 1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with NFPA 262.

2.11 CONTROL-CIRCUIT CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Encore Wire Corporation.
 - 2. General Cable Technologies Corporation.
 - 3. Southwire Company.
- B. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.
- C. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.
- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- E. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.
 - 1. Smoke control signaling and control circuits.

2.12 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.

- B. Factory test UTP cables according to TIA-568-C.2.
- C. Factory test optical-fiber cables according to TIA-568-C.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
 - 1. Test optical-fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
 - 2. Test optical-fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
 - 3. Test each pair of UTP cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
 - 2. Outlet boxes for optical-fiber cables shall be no smaller than 4 inches square by 2-1/8 inches deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
 - 3. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.

2. Install cable trays to route cables if conduits cannot be located in these positions.
 3. Secure conduits to backboard if entering the room from overhead.
 4. Extend conduits 3 inches above finished floor.
 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- E. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. General Requirements for Cabling:
1. Comply with TIA-568-C Series of standards.
 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems."
 3. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 4. Cables may not be spliced.
 5. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Install lacing bars and distribution spools.
 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
 9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Monitor cable pull tensions.
 10. Support: Do not allow cables to lay on removable ceiling tiles.
 11. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
- C. UTP Cable Installation:
1. Comply with TIA-568-C.2.

2. Install termination hardware as specified in Section 271500 "Communications Horizontal Cabling" unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."

E. Optical-Fiber Cable Installation:

1. Comply with TIA-568-C.3.
2. Terminate cable on connecting hardware that is rack or cabinet mounted.

F. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

G. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Below each feed point, neatly coil a minimum of 72 inches of cable in a coil not less than 12 inches in diameter.

H. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches.

- c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches.
- 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches.
- 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches.
- 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.
- 6. Separation between Communications Cables and LED Fixtures: A minimum of 5 inches.

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.5 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
 - 1. Class 1 remote-control and signal circuits; No 14 AWG.
 - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
 - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

- A. Comply with TIA-569-B, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Visually inspect UTP and optical-fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test UTP cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy

(Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical-Fiber Cable Tests:

- a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.0. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- b. Link End-to-End Attenuation Tests:
 - 1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for links shall be less than 2.0 dB.
- C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 26 05 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Ground rings.
 - 4. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Instructions for periodic testing and inspection of grounding features at test wells based on NFPA 70B.
 - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - 2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Burndy; Part of Hubbell Electrical Systems.
 2. ERICO International Corporation.
 3. Fushi Copperweld Inc.
 4. ILSCO.
 5. O-Z/Gedney; A Brand of the EGS Electrical Group.
 6. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 12 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
 - 1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
 - 2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.

- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate

conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare, tinned copper, not less than No. 8 AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 - 3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building's foundation.

I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and

connect to building's grounding grid or to grounding electrode external to concrete.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- E. Grounding system will be considered defective if it does not pass tests and inspections.

- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
 - 5. Substations and Pad-Mounted Equipment: 5 ohms.
 - 6. Manhole Grounds: 10 ohms.
 - 7. ohms.
- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. Thomas & Betts Corporation.
 - e. Unistrut; Tyco International, Ltd.
 - 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 4. Channel Dimensions: Selected for applicable load criteria.

- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels, and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 - 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 - 3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
 - 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc. ICC# ECR-1663
 - 2) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit. ICC# ECR-3037

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc. ICC# ECR-2302
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc. ICC# ECR-2427
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033053 "Miscellaneous Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. LEED Submittals:
 1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 1. Structural members in paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Allied Tube & Conduit; a Tyco International Ltd. Co.

2. O-Z/Gedney; a brand of EGS Electrical Group.
 3. Republic Conduit.
 4. Southwire Company.
 5. Thomas & Betts Corporation.
 6. Western Tube and Conduit Corporation.
 7. Wheatland Tube Company; a division of John Maneely Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit IMC.
1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch, minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew or compression.
 2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.
 2. CANTEX Inc.
 3. Condux International, Inc.
 4. Electri-Flex Company.
 5. RACO; a Hubbell company.
 6. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. LFNC: Comply with UL 1660.
- F. Rigid HDPE: Comply with UL 651A.
- G. Continuous HDPE: Comply with UL 651B.
- H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- I. RTRC: Comply with UL 1684A and NEMA TC 14.
- J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- K. Fittings for LFNC: Comply with UL 514B.
- L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- M. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper B-Line, Inc.
 2. Hoffman; a Pentair company.
 3. Mono-Systems, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Flanged-and-gasketed type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Moulded Products, Inc.
 2. Hoffman; a Pentair company.
 3. Lamson & Sessions; Carlon Electrical Products.
 4. Niedax-Kleinhuis USA, Inc.
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

- D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- E. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Prime coated, ready for field painting.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Mono-Systems, Inc.
 - b. Panduit Corp.
 - c. Wiremold / Legrand.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from custom colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following] available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems Division.
 - b. Mono-Systems, Inc.
 - c. Panduit Corp.
 - d. Wiremold / Legrand.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Technologies Company; Cooper Crouse-Hinds.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman; a Pentair company.
 5. Hubbell Incorporated; Killark Division.
 6. O-Z/Gedney; a brand of EGS Electrical Group.
 7. RACO; a Hubbell Company.
 8. Thomas & Betts Corporation.
 9. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
1. Material: Cast metal.
 2. Type: Fully adjustable.
 3. Shape: Rectangular.
 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep.
- K. Gangable boxes are prohibited.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Fiberglass.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. CDR Systems Corporation; Hubbell Power Systems.
 - c. Oldcastle Precast, Inc.; Christy Concrete Products.
 - d. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC." OR "Telecommunication".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of reinforced concrete.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation; Hubbell Power Systems.
 - d. NewBasis.
 - e. Nordic Fiberglass, Inc.
 - f. Oldcastle Precast, Inc.; Christy Concrete Products.
 - g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
 2. Standard: Comply with SCTE 77.
 3. Color of Frame and Cover: Green.
 4. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
 5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 7. Cover Legend: Molded lettering, "ELECTRIC."
 8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: EMT.
 3. Underground Conduit: RNC, Type EPC-80-PVC, concrete encased.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed, Not Subject to Severe Physical Damage: RNC identified for such use.
 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: GRC.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from PVC to GRC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit.
 2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength.
 3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or

equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
- 2. Sleeve-seal systems.
- 3. Sleeve-seal fittings.
- 4. Grout.
- 5. Silicone sealants.

B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

- 1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Sleeves for Rectangular Openings:
 1. Material: Galvanized sheet steel.
 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Carbon steel.
 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Presealed Systems.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
 2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

- a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
- 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with 2019 California Electrical Code.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. White letters on an black field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
 - 1. Black letters on an orange field.
 - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."
- D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

- F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.
- H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- I. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

- G. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.
- H. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Write-on, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- G. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.4 FLOOR MARKING TAPE

- A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Detectable Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

C. Tag: Type I:

1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: 4 mils.
3. Weight: 18.5 lb/1000 sq. ft..
4. 3-Inch Tensile According to ASTM D 882: 30 lbf, and 2500 psi.

D. Tag: Type II:

1. Multilayer laminate consisting of high-density polyethylene scrim coated with pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: 12 mils.
3. Weight: 36.1 lb/1000 sq. ft..
4. 3-Inch Tensile According to ASTM D 882: 400 lbf, and 11,500 psi.

E. Tag: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft..
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

F. Tag: Type IID:

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 8 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 34 lb/1000 sq. ft.
5. 3-Inch Tensile According to ASTM D 882: 300 lbf, and 12,500 psi.

2.6 WARNING LABELS AND SIGNS

A. Comply with 2019 California Electrical Code and 29 CFR 1910.145.

B. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

C. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.9 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

- K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot maximum intervals.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:

- 1) Phase A: Black.
- 2) Phase B: Red.
- 3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

- 1) Phase A: Brown.
- 2) Phase B: Orange.
- 3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

- F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.
- G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.
- I. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.
- J. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- K. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- L. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.

2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- M. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- N. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- O. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- P. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to Be Labeled:

- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
- b. Enclosures and electrical cabinets.
- c. Access doors and panels for concealed electrical items.
- d. Switchboards.
- e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
- f. Emergency system boxes and enclosures.
- g. Enclosed switches.
- h. Enclosed circuit breakers.
- i. Enclosed controllers.
- j. Push-button stations.
- k. Contactors.
- l. Remote-controlled switches, dimmer modules, and control devices.
- m. Monitoring and control equipment.

END OF SECTION 26 05 53

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Standalone daylight-harvesting switching controls.
4. Indoor occupancy sensors.
5. Emergency shunt relays.

- B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 1. Interconnection diagrams showing field-installed wiring.
 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Industries, Inc.
 2. Intermatic, Inc.
 3. Leviton Mfg. Company Inc.
 4. NSi Industries LLC; TORK Products.
 5. Tyco Electronics; ALR Brand.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
1. Listed and labeled as defined in 2019 California Electrical Code, by a qualified testing agency, and marked for intended location and application.
 2. Contact Configuration: DPST.
 3. Contact Rating: 20-A ballast load, 120-/240-V ac.
 4. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
 5. Astronomic Time: All channels.
 6. Automatic daylight savings time changeover.
 7. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.
- C. Electromechanical-Dial Time Switches: Comply with UL 917.
1. Listed and labeled as defined in 2019 California Electrical Code, by a qualified testing agency, and marked for intended location and application.
 2. Contact Configuration: DPST.
 3. Contact Rating: 20-A ballast load, 120-/240-V ac.
 4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
 5. Astronomic time dial.
 6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
 7. Skip-a-day mode.
 8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Bryant Electric; a Hubbell company.
 2. Cooper Industries, Inc.
 3. Hubbell Building Automation, Inc.
 4. Leviton Mfg. Company Inc.
 5. Lutron Electronics Co., Inc.
 6. NSi Industries LLC; TORK Products.
 7. Sensor Switch, Inc.
 8. Square D; a brand of Schneider Electric.
 9. Watt Stopper.
- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 7. Bypass Switch: Override the "on" function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy .
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot- high ceiling in a corridor not wider than 14 feet.
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Industries, Inc.

2. Hubbell Building Automation, Inc.
3. Leviton Mfg. Company Inc.
4. NSi Industries LLC; TORK Products.
5. Sensor Switch, Inc.
6. Square D; a brand of Schneider Electric.
7. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor 180-Degree:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP, dual circuit. SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

D. Wall-Switch Sensor 210-Degree:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.
3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.

8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.4 EMERGENCY SHUNT RELAY

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Lighting Control and Design; Acuity Lighting Group, Inc.
 2. Watt Stopper.
- B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
 1. Coil Rating: 120 277 V.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Lighting control devices will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 26 09 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Receptacles with integral surge-suppression units.
 - 4. Isolated-ground receptacles.
 - 5. Weather-resistant receptacles.
 - 6. Wall-switch and exterior occupancy sensors.
 - 7. Communications outlets.
 - 8. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Service/Power Poles: One for every 10, but no fewer than one.
 - 2. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
 - 3. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.
 - 4. TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand (Pass & Seymour).

- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; IG5362RN.
 - b. Hubbell; IG5362.
 - c. Leviton; 5362-IG.
 - d. Pass & Seymour; IG5362.
 - 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be

integral to receptacle construction and not dependent on removable parts.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GFR5352L.
 - c. Pass & Seymour; 2095.
 - d. Leviton; 7590.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hubbell; GFTR20.
 - b. Pass & Seymour; 2095TR.

2.5 TVSS RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

B. Duplex TVSS Convenience Receptacles:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 5362BLS.
 - b. Hubbell; HBL5362SA.
 - c. Leviton; 5380.
 - d. Pass & Seymour; 5362BLSP.
2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

C. Isolated-Ground, Duplex Convenience Receptacles:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; IG5362BLS.
 - b. Hubbell; IG5362SA.
 - c. Leviton; 5380-IG.
 - d. Pass & Seymour; IG5362BLSP.
2. Description:
 - a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; CWL520R.
 - b. Hubbell; HBL2310.
 - c. Leviton; 2310.
 - d. Pass & Seymour; L520-R.
- B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; IGL520R.
 - b. Hubbell; IG2310.
 - c. Leviton; 2310-IG.
 - d. Pass & Seymour; IG4700.
2. Description:
 - a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.7 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Single Pole:
 - 2) Cooper; AH1221.
 - 3) Hubbell; HBL1221.
 - 4) Leviton; 1221-2.
 - 5) Pass & Seymour; CSB20AC1.
 - 6) Two Pole:
 - 7) Cooper; AH1222.
 - 8) Hubbell; HBL1222.
 - 9) Leviton; 1222-2.
 - 10) Pass & Seymour; CSB20AC2.
 - 11) Three Way:
 - 12) Cooper; AH1223.
 - 13) Hubbell; HBL1223.
 - 14) Leviton; 1223-2.
 - 15) Pass & Seymour; CSB20AC3.
 - 16) Four Way:
 - 17) Cooper; AH1224.
 - 18) Hubbell; HBL1224.
 - 19) Leviton; 1224-2.
 - 20) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; AH1221PL for 120 and 277 V.
 - b. Hubbell; HBL1201PL for 120 and 277 V.
 - c. Leviton; 1221-LH1.
 - d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; AH1221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.
 - d. Pass & Seymour; PS20AC1-L.
2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 1995L.
 - b. Hubbell; HBL1557L.

- c. Leviton; 1257L.
- d. Pass & Seymour; 1251L.

2.8 DECORATOR-STYLE DEVICES

- A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 6252.
 - b. Hubbell; DR15.
 - c. Leviton; 16252.
 - d. Pass & Seymour; 26252.
- B. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
 - 1. Products: Subject to compliance with requirements,:
 - a. Cooper; TR6252.
 - b. Hubbell; DR15TR.
 - c. Pass & Seymour; TR26252. number(s)>.
 - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- C. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; TWRBR15.
 - b. Hubbell; DR15TR.
 - c. LevitonTRW15.
 - d. Pass & Seymour; TRW26252.
 - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

- D. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; VGF15.
 - b. Hubbell; GF15LA.
 - c. Leviton; 8599.
 - d. Pass & Seymour; 1594.
- E. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; TWRVGF15.
 - b. Hubbell; GFTR15.
 - c. Pass & Seymour; 1594TRWR.
 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 7621 (single pole), 7623 (three way).
 - b. Hubbell; DS115 (single pole), DS315 (three way).
 - c. Leviton; 5621-2 (single pole), 5623-2 (three way).
 - d. Pass & Seymour; 2621 (single pole), 2623 (three way).
- G. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 7631 (single pole), 7633 (three way).

- b. Hubbell; DS120IL (single pole), DS320 (three way).
- c. Leviton; 5631-2 (single pole), 5633-2 (three way).
- d. Pass & Seymour; 2625 (single pole), 2626 (three way).

2. Description: With neon-lighted handle, illuminated when switch is "off."

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.11 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems.
 - 2. Wiremold/Legrand.
- B. Description:
 - 1. Two-piece surface metal raceway, with factory-wired multioutlet harness.

2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: PVC.

D. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
2. Receptacle Spacing: 9 inches.
3. Wiring: No. 12 AWG solid, Type THHN copper, two circuit, connecting alternating receptacles.

2.12 SERVICE POLES

A. Description:

1. Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
2. Poles: Nominal 2.5-inch- square cross section, with height adequate to extend from floor to at least 6 inches above ceiling, and with separate channels for power wiring and voice and data communication cabling.
3. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
4. Finishes: Satin-anodized aluminum.
5. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, four-pair, Category 3 or Category 5 voice and data communication cables.
6. Power Receptacles: Two duplex, 20-A, straight-blade receptacles complying with requirements in this Section.
7. Voice and Data Communication Outlets: Four RJ-45 jacks complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.13 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: White <Insert color> unless otherwise indicated or required by NFPA 70 or device listing.
2. TVSS Devices: Blue.
3. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtail existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 27 26

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600-V ac and less for use in control circuits enclosed switches enclosed controllers.
 - 2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches.
 - 3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
 - 4. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Current-limitation curves for fuses with current-limiting characteristics.
 - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit on translucent log-log graph paper.

5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Ambient temperature adjustment information.
 2. Current-limitation curves for fuses with current-limiting characteristics.
 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit on translucent log-log graph paper.
 4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

1.7 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.8 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Ferraz Shawmut, Inc.
 - 4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
 - 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
 - 1. Motor Branch Circuits: Class RK5, time delay.
 - 2. Other Branch Circuits: Class RK1, time delay.
 - 3. Control Circuits: Class CC, fast acting.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.
- C. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Receptacle switches.
 - 4. Shunt trip switches.
 - 5. Molded-case circuit breakers (MCCBs).
 - 6. Molded-case switches.
 - 7. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Fuse Pullers: Two for each size and type.

1.9 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 - 2. Altitude: Not exceeding 6600 feet.

1.11 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 1. Instantaneous trip.
 2. Long- and short-time pickup levels.
 3. Long- and short-time time adjustments.
 4. Ground-fault pickup level, time delay, and I²t response.
- F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Communication Capability: Circuit-breaker-mounted Integral communication module with functions and features compatible with power monitoring and control system, specified in Section 260913 "Electrical Power Monitoring and Control."
6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
8. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
11. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.
13. Accessory Control Power Voltage: Integrally mounted, self-powered; 120-V ac.

2.3 MOLDED-CASE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

- B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Features and Accessories:
 - 1. Standard frame sizes and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - 6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
 - 7. Alarm Switch: One NO contact that operates only when switch has tripped.
 - 8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
 - 9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
 - 10. Electrical Operator: Provide remote control for on, off, and reset operations.
 - 11. Accessory Control Power Voltage: Integrally mounted, self-powered; 120-V ac.

2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

END OF SECTION 26 28 16

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: LED Luminaires, LED modules, drivers, wiring, and lighting controls.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 26 0500: Common Work Results for Electrical.
 - 3. Section 26 0513: Basic Electrical Materials and Methods.
 - 4. Section 26 0526: Grounding and Bonding.
 - 5. Section 26 0519: Low-Voltage Wires (<600 Volt AC).
 - 6. Section 26 0923: Lighting Controls Systems.
 - 7. Section 26 5200: - Emergency Power Systems.
 - 8. Section 32 1313 - Site Concrete Work.

1.2 REFERENCES

- A. American National Standards Institute/American National Standard Lighting Group ANSI/ANSLG – C78.377-2008 Specifications for the Chromaticity of Solid-State Lighting Products.
- B. American National Standards Institute/American National Standard Lighting Group ANSI/ANSLG – C82.77-2002 Harmonics Emission Limits.
- C. Federal Communication Commission (FCC) 47 CFR Part 15 – Radio Frequency Devices.
- D. Illuminating Engineering Society of North America (IESNA) LM-79-, LM-80-15, and TM-21.
- E. National Electrical Manufacturers Association (NEMA) SSL-1-2010 Electronic Drivers for LED Devices, Arrays, or Systems.
- F. SSL-3-2010 Solid State Lighting High Power LED Binning for General Illumination.
- G. SSL-4-2012 Solid State Lighting Retrofit Lamps.
- H. National Fire Protection Association (NFPA) NEC-70-2011
- I. Underwriters Laboratories (UL) 8750-Light Emitting Diode (LED) Equipment for Use in Lighting Products.

- J. Underwriters Laboratories (UL) 1598C- Light Emitting Diode (LED) Retrofit Luminaire Conversion Kits.

1.3 SUBMITTALS

- A. List of Materials: Submit a complete list of proposed materials.
- B. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size of lamps, and complete details of method of fitting suspension and fastening luminaires in place. Provide wiring diagrams for lighting control equipment. Drawings shall contain sufficient information to assemble and install equipment at the Project site without further instructions.
- C. Prior to start of construction; provide photometric calculations with graphic of lighting foot-candle levels at work plane, ceiling and walls. Calculations shall comply with IESNA recommendations.
- D. Installation Instructions: Submit manufacturer's written installation instructions for luminaires and accessories.

1.4 SUBSTITUTIONS

- A. Luminaires that deviate from these requirements shall not be accepted without written approval from OWNER'S Design Standards Section and Maintenance and Operations Technical Unit. When deviating or substituting luminaires, the following information shall be submitted:
 - 1. Substitution request form substantiating reasons and benefits to OWNER.
 - 2. OWNER'S approval shall be obtained for any equipment or materials substitutions. Proposed substitutions requests shall provide proof of compliance with OWNER'S LED Luminaires Evaluation Requirements found at the following electronic address:
- B. Substitutions: Submittals must comply with contract general provisions.

1.5 QUALITY ASSURANCE

- A. Design of lighting luminaires, accessories, supports, and method of luminaire installation shall comply with requirements for earthquake-resistant construction of the State of California.
- B. Provide suspension points at no more than two feet from luminaire ends. Spacing between supports shall not exceed eight feet.

- C. Components and luminaires shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes, including those mentioned under article 1.02 – References.

1.6 WARRANTY

- A. Provide a one-year labor warranty.
- B. Provide material warranty as specified:
 - 1. LED modules: five years minimum.
 - 2. Drivers: five years minimum.
 - 3. Lighting Pole (Standards): five year minimum.
- C. Warranty period begins at substantial completion or project acceptance for beneficial occupancy.
- D. CONTRACTOR shall warranty Luminaires, including drivers, LED modules and ancillary components via a single warranty source. Multiple warranty sources are not acceptable.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

- A. Lighting luminaires shall be the type indicated on Drawings and as specified. Luminaires of same type shall be of one manufacturer.
- B. Specific manufacturer and model number references are indicated as a standard of performance and quality; other manufacturers' models may be submitted for review, provided the product meets or exceeds the specifications and substantially complies with OWNER'S LED Luminaires Evaluation Requirements Form.
- C. Conductors that pass over edges or through metal opening(s) shall be secured from contacting the edges or be protected from cutting and abrasion. This requirement shall be met through one of the following:
 - 1. Rolling the edge of the metal not less than 120 degrees.
 - 2. A bushing or grommet of a material other than rubber at least 1.2 mm (0.047") thick.
 - 3. Glass sleeving at least 0.025 mm (0.010") thick.
- D. Lighting luminaires shall meet the following requirements:

1. Industry standards as indicated under REFERENCES Article.
2. Luminaire shall be from a manufacturer who has been in the business of manufacturing LED lighting luminaires for interior and exterior applications for a minimum of 5 years.
3. Luminaires shall comply with the California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency and Toxics Reduction Act, or be in compliance with the European Restriction of Hazardous Substances (RoHS), whichever is more stringent.
4. Luminaires shall be baked-on enamel or powder-coated, unless otherwise specified in this section.
5. The luminaire(s) lens, including end caps shall be 0.187 nominal thickness.
6. Drivers shall be easily accessible without the use of special tools.
7. Wiring cavity shall be field accessible for service or repairs.
8. Luminaires shall be capable of being operated by standard motion/vacancy sensors, daylight sensors, and dimmers.
9. Luminaires shall be provided with a manufacturer's stencil or permanent legible sticker that states manufacturer business information and date of delivery.
10. Temperature rating; -20 degrees Celsius minimum starting temperature. Luminaire accessories including LEDs and drivers shall be able to withstand temperatures in excess of 110 Fahrenheit degrees.
11. Color Rendering Index (CRI):
 - a. Interior Applications: +82 CRI.
 - b. Exterior Applications: +70 CRI
12. Power factor: Greater than 0.9 at 120V and 277V.
13. Total Harmonic Distortion: Less than 20% at 120V and 277V.
14. Color Correlated Temperature: 4000K minimum \pm 275K degrees.
15. LEDs and driver's life expectancy: 50,000 minimum projected hours at 6,000 hours testing for both LEDs and drivers.
16. Luminaires in contact with insulation materials shall be IC rated.

2.2 DRIVERS AND LED MODULES

A. Drivers:

1. Approved Drivers Manufacturers:
 - a. Osram – Optotronic.
 - b. Philips – Advance and Xitanium.
 - c. Universal Lighting Technologies – Everline.
 - d. General Electric – Lightech.
 - e. Thomas Research Products
 - f. Kenall – Low Profile LED Driver
 - g. EldoLED

- h. Others only if approved by Torrance Airport M&O Technical Services and Design Standards units.

2. Driver Type and Characteristics:

- a. Comply with the state of California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency and Toxics Reduction Act, or be RoHS compliant, whichever is more stringent.
- b. Dimming for 0-10 volt DC control circuits. Drivers shall be specifically compatible with the lighting control system being provided.
- c. Comply with applicable state, federal, and industry standards listed under References article.
- d. Wattage as stated in Luminaire's LM-79 test report.
- e. Driver performance requirements:

DRIVERS PERFORMANCE CHARACTERISTICS		
No.	Characteristic	Minimum Requirements
1	Input Voltage range	120V, 277V
2	Input Overvoltage	320 VAC for 48 hours, 350 VAC for 2 hours.
3	Frequency	50/60 Hz Nominal
4	Power factor	0.95 Minimum
5	Inrush Current	Less than 30 amps @ 120V, Less than 70A @ 277V
6	Input Current Range	54A @ 120V, 23A @ 277V
7	Output Current	1670 mA Maximum
8	Maximum Power	65 Watts
9	Total Harmonic Distortion	Less than 20%
10	Leakage Current	Less than 500 mA
11	Output Protection	Short and Open Circuit
12	Maximum Case	90° C
13	Minimum Starting	-20° C
14	Storage Temperature	No less than 70° C
15	Humidity	Rated for dry and damp
16	Cooling	Convection
17	Sound Rating	Class A

18	Life Expectancy	>50,000 hours at +50° C
19	Dimming, Motion Sensors and Daylight Sensors	0-10V

B. LEDs:

1. Approved Manufacturers:

- a. General Electric.
- b. Philips.
- c. NICHIA
- d. Samsung LED Co.
- e. CREE

2. LEDs Characteristics:

- a. Color Correlated Temperature (CCT):
 - 1) Chromaticity target Duv and tolerance 0.001 plus/minus 0.006.
 - 2) Nominal CCT for 4000K, target CCT 3985K \pm 275K.
 - 3) CCT measurements in compliance with ANSI C78.377-2008.
- b. Lumen Maintenance: Greater than 90% at 500 C degrees.
- c. LEDs must be from same manufacturer and batch.
- d. TM-21 and LM-80 reported hours of no less than 50,000.
- e. LM-79 reported CCT and CRI in compliance with articles 2.09.D.9 and 12.

2.3 LUMINAIRES (For exact make and model refer to lighting fixture schedule on electrical plans)

A. Lighting Luminaire Types:

1. Ceiling Surface-mounted or Recessed Troffer Luminaires:

- a. 22 gage extruded aluminum doorframes, white baked enamel finish. Spring loaded and half recessed with flush latches and T-handle hinge, accessible from bottom to drivers and wiring. Clear prismatic 100 percent pure virgin acrylic Pattern 12.
- b. Recessed Troffer Housing minimum depth shall be 4 ½-inch to eliminate lamp images in lens.
- c. Minimum lens thickness 0.187 inch.
- d. Furnish mounting frames on recessed luminaires in plaster and tile surfaces.
- e. Manufacturers and catalog numbers: Modify catalog numbers for mounting in gypsum drywall ceilings, as required.

2. Surface-Mounted Industrial Luminaires:
 - a. Approximately 48-inch or 96-inch long by 16-inch wide by 7 ½-inch deep.
 - b. Provide couplings, clips and end caps for continuous row installation.
 - c. Furnish luminaires with screw-on wire guards. Design guards to accommodate luminaire, provided by same manufacturer as luminaire.
 - d. Exposed LED strips are not allowed.
 - e. Housing shall be made of die formed 20 gage cold rolled steel.
3. Surface Mounted Strip Light:
 - a. Luminaire shall be made of 20 gage die formed steel and have the ability for continuous row mounting.
 - b. Furnish luminaires with LED strips as indicated on drawings. Luminaire shall have the option to have narrow or wider housing channels depending on the application.
4. Enclosed and Vandal Resistant Luminaires:
 - a. Luminaire shall be 20 gage extruded aluminum with die cast end caps.
 - b. Luminaire shall have opal polycarbonate lens.
 - c. Furnish luminaires with LED strips as indicated on drawings. Luminaire shall have tamper resistant hardware.
 - d. Luminaire shall have the ability to be in continuous rows with seamless appearance.
 - e. Luminaire shall be listed for wet location.
5. Enclosed, Gasketed Luminaire:
 - a. Luminaire shall be 20 gage steel.
 - b. Lens enclosure shall be heavy duty vapor tight enclosed gasketed with closed-cell foam gasketing permanently attached to luminaire housing.
 - c. Luminaire shall have tamperproof latches.
 - d. Luminaire shall be furnished with minimum one watertight hub kit for top or end conduit entry.
 - e. Luminaire shall have option for cable mount and safety strap
 - f. Wet Location listed.
6. Surface, Wall or Recess Mounted fixtures
 - a. Luminaire shall be 20 gage extruded aluminum with die cast end caps.
 - b. Opal polycarbonate lens.
 - c. Furnish luminaires with LED strips as indicated on drawings.

- d. Luminaire mounting as indicated on drawings.
 - e. Luminaire shall be listed for damp and wet location.
7. Down Lights:
- a. 4 to 6 inch round LED downlight.
 - b. Color trim as specified in construction drawings.
 - c. Trim attachment to frame-in kit via push-in connector on frame.
 - d. Removable cover for access.
 - e. Complete luminaire including all peripheral devices including frame-in kit, light engine, trim kit, etc. shall be provided.
8. High Abuse Surface Luminaires:
- a. Lens shall be extruded polycarbonate, clear prismatic refractor, nominal thickness 0.125 inch, UV stabilized.
 - b. Baseplate shall be 18 gage prime cold-rolled steel with corrosion-resistant, 92 percent reflective, white polymer finish.
 - c. End caps shall be 16 gage prime cold roll steel with corrosion-resistant, white polymer finish and shall be spot welded to the baseplate.
 - d. Lens/housing shall be furnished with a minimum of two large or four small stainless steel fasteners to secure lens/housing to base plate.
 - e. Listed for wet and damp locations.
9. Wall Mounted Vaportite Luminaire:
- a. Luminaire housing shall be die cast aluminum with corrosion resistant polyester powder coated finish.
 - b. Luminaire shall be heat and shock resistant, with prismatic glass optical chamber with neoprene gasketing.
 - c. Luminaire shall be 15 or 20 watt LED; LEDs and drivers as indicated on drawings.
 - d. Luminaire shall be equipped with lens guard.
10. Ceiling-Mounted Luminaires:
- a. Separate ceiling and reflector pans with foil-backed fiberglass between pans and 1/8 inch thick neoprene gasketing between ceiling pan and ceiling.
 - b. White polyester finished 18 gage cold-rolled steel back-plate with clear prismatic injection molded polycarbonate lens, UV stabilized heavy gage aluminum back-plate and four tamper-proof screws.
 - c. Provide luminaire wattage as indicated on drawings.
 - d. Luminaire shall be listed for damp locations.
11. Ceiling / Wall Mounted Luminaires:
- a. Luminaire shall be die-cast aluminum.

- b. Luminaire shall have reinforced four-point mounting system construction to resist breakage from impact and prying.
- c. Luminaire finish shall be as indicated on drawings.
- d. Lens shall be Injection molded UV stabilized, high impact resistant opal polycarbonate.
- e. Luminaire shall have option trim ring to fit between housing and inside lip of trim ring for a smooth transitional look.
- f. Provide luminaire with input watts as indicated on drawings.
- g. Ceiling luminaires shall be supplied without eye lid option, wall mounted luminaires shall be supplied with eye lid option.

12. Outdoor Wall-Mounted Luminaires (Vandal Resistant):

- a. Seamless, one-piece, injection molded polycarbonate lens/housing, 0.187 inch, UV stabilized polycarbonate lens. The wraparound lens design encloses and protects the interior of unit.
- b. Die cast aluminum mounting plate.
- c. One-piece, full size, closed cell neoprene rubber gasket.
- d. One stainless steel tamper-proof screw.
- e. Luminaire shall be UL listed for wet locations.
- f. Luminaires shall be provided with input watts as indicated on drawings.

13. Wall Mounted Full Cutoff Exterior Wall.

- a. Luminaire shall be mounted at no less than nine feet above finished grade, or as indicated in drawings.
- b. Housing shall be made of 20 gage die cast aluminum, and be equipped with hinged doors.
- c. Luminaire shall have Stainless steel tamperproof hardware.
- d. Luminaire shall be provided with input watts as indicated on drawings. Luminaire Optics shall be full 90 degree horizontal cutoff on all distributions. Reflector shall be specular aluminum. Luminaire shall have tempered glass lens with optional wire guard.

14. Wall-Mounted Luminaires (Vandal Resistant):

- a. One-piece prismatic refractor held by cast metal door, hinged to die-cast anodized aluminum weatherproof housing with visor to limit light pollution.
- b. Die-cast aluminum housing of 1/8 inch minimum wall thickness. Luminaire shall be provided with tamper-proof screws.
- c. High impact resistant, UV stabilized injection molded polycarbonate lense.
- d. High power LEDs.

2.4 EXIT ILLUMINATION

A. Lighting Luminaire:

1. Ceiling or wall-mounted, vandal-resistant type, LED EXIT, consisting of:
 - a. LED board, green exit lettering and directional arrows as indicated on drawings.
 - b. Face plate and polycarbonate shield.
 - c. Number of faces, voltage, and emergency power source shall conform to design requirements indicated on drawings.
 - d. Area of refuge listing is required when luminaires are used in such locations.
 - e. Utilize a flag mount luminary with additional support from the ceiling or wall for canopy or pendant mounted exit signs. This option shall be exercised only if a wall is not available.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install a lighting luminaire for each lighting outlet indicated and label with day of installation.
- B. Luminaire voltage shall be as indicated on Drawings.
- C. Install recessed and surface-mounted luminaires, with plaster frames compatible with ceiling and wall systems employed; secure luminaires mechanically to frames.
- D. Align rows of suspended and surface-mounted luminaires to form straight lines at uniform elevations.
- E. Recessed luminaires shall fit snugly against ceilings to prevent light leakage.
- F. Luminaire installations shall comply with CBC Seismic requirements
- G. Support suspended recessed luminaires in T-bar ceilings as follows: Luminaires shall be attached to ceiling grid to resist a horizontal force equal to weight of luminaires. For heavy-duty grid systems, luminaires weighing less than 56 pounds must also have two 12 gage slack safety wires from diagonal corners to the structure above; luminaires weighing more than 56 pounds shall be independently supported by not less than four taut 12 gage wires capable of supporting four times the load. For intermediate duty grid systems, luminaires shall be independently supported by not less than four taut 12 gage wires capable of supporting four times the load. Luminaire hanger wire ends shall be twisted three tight turns within a 1 ½ -inch distance. Provide positive point of

attachment to T-bar ceiling with four, #8 wafer head tek screws (one at each corner), avoiding conflict with operation of the lens. Luminaire installation shall be coordinated with acoustical ceiling installation.

- H. Emergency light luminaires shall be labeled "Emergency Luminaire" with one inch high letters produced with a P-touch or similar labeling system.
- I. Continuous suspended luminaires:
 - 1. Luminaire suspension device shall allow vertical adjustment of luminaire without the use of tools. Cable shall be minimum seven strand twisted stainless steel capable of supporting minimum four times the luminaire weight. For continuous linear suspended luminaires longer than eight feet, provide not less than three suspension points.
 - 2. Top of luminaire shall be suspended as shown on the Drawings, typically 24 inches below the ceiling and a minimum of 18 inches from the ceiling.
 - 3. Luminaire shall utilize factory furnished or approved hardware and canopy for either hard or T-bar ceilings.
 - 4. White Board Lights shall be suspended 24 inches from the wall unless specifically shown otherwise.
- J. Surface mount luminaires shall be attached to structure. Toggle bolts are NOT permitted. Provide backing where required.
- K. Low level exit signs shall be installed with the bottom of the sign not less than six inches, or more than eight inches above the floor level and shall indicate the path of exit travel. For exit and exit-access doors, the sign shall be on the door or adjacent to the door with the closest edge of the sign within four inches of the door frame.

3.2 TESTING

- A. Check and adjust luminaires for required illumination.
- B. Replace defective LED strips and drivers.
- C. Test and adjust lighting control equipment for proper operation.

3.3 SPARE PARTS

- A. Furnish ten percent spare LED strips with a minimum of one spare strip of each type.
- B. Furnish ten percent spare motion detectors of each type with a minimum of one spare detector of each type.

- C. Furnish ten percent spare drivers of each type with a minimum one spare driver of each type.

3.4 HAZARDOUS WASTE DISPOSAL

- A. Hazardous waste disposals shall be handled and disposed of by an approved, licensed contractor.
- B. Products with PCBs are not acceptable. Hazardous waste shall be placed in appropriate containers provided by hazardous waste contractor labeled clearly with:
 - 1. Project Name
 - 2. Quantity of materials
 - 3. Date materials became waste
- C. Store, remove, transport and dispose of hazardous materials in accordance with state and federal regulations.
- D. Provide Owner with copy of manifest and certificate of destruction.

3.5 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.6 CLEANUP

- A. Remove rubbish, debris, and waste materials from all areas of work each day.
- B. Clean luminaire surfaces of dirt, cement, plaster and debris. Furnish cleansers compatible with material surfaces being cleaned.

END OF SECTION 26 51 00

PART 1 – GENERAL

1.01 SCOPE

- A. Contractor shall provide expansion of existing Gamewell-FCI E3 Series 24VDC analog addressable fire alarm system/voice evacuation with System Sensor two wire synchronized notification and a LifeGuard Networks IP based building automation and control system. The audible appliances shall be speakers. The Fire Alarm Control Panel (FACP) or panels shall be microprocessor-based, network capable and complete with an integral Digital Alarm Communications Transmitter (DACT) that is UL listed for Remote Station, Proprietary and Central Station fire alarm systems. The FACP shall be compliant with UL 864, 9th edition. The fire alarm system shall be connected/integrated to the existing district LifeGuard Networks centralized integration and automation system. Provide interlock with “lock down”

1. The fire alarm system shall be provided and installed by a Gamewell-FCI Elite Partner and LifeGuard Networks Authorized Distributor. Systems provided and/or installed by anyone other than an Authorized Distributor shall be considered in non-compliance with this specification and subject to replacement at the expense of the Prime Contractor.

- a) The Gamewell-FCI Elite Partner and LifeGuard Networks Authorized Distributor shall furnish all labor, materials, appliances, cabling, tools, equipment, facilities transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of all equipment, wiring, programming, configuration, testing, training required by this Section, complete as indicated on the applicable Contract Drawings and/or specified herein.

- a) This specification provides the requirements for the installation, programming, configuration, testing and maintenance of a complete analog addressable fire alarm system. This system shall include, but not be limited to:

(a) Fire Alarm Control Panel (FACP)

(1) System cabinet

(2) Power supply

- (b) Annunciator/keypad (if required).
- (c) Batteries
- (d) Wiring
- (e) Conduit
- (f) Associated peripheral devices
- (g) Other relevant components and accessories required to provide a complete and operational analog addressable reporting Life Safety System.

- B. The fire alarm system shall be capable of providing, at a minimum, the following:
 - 1. Fire Alarm Control Panel (FACP)
 - a) Integral Digital Alarm Communications Transmitter (DACT).
 - b) Network Interface capability via copper and/or fiber optic network.
 - 2. Analog addressable initiation devices
 - 3. Analog addressable control modules
 - 4. Notification appliances
 - a) Speakers – selectable output with plug-in design.
 - b) Strobes - Compatible with two wire synchronized circuit.
 - 5. Notification Appliance Circuit (NAC) remote power supply
 - a) Combination horn/strobe two wire circuit.
 - b) Built-in synchronization capabilities
 - 6. Internet Protocol (IP) connectivity for remote access capability via LAN/WAN network
 - 7. Voice Evacuation capability
 - 8. Firefighter Telephone capability
- C. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this Specification.

- D. The Analog Addressable Fire Alarm System specified herein shall be connected to a UL Listed Central Station monitoring company.
 - 1. Contractor shall coordinate with the Owner or his representative to obtain two telephone lines for code required offsite monitoring.
- E. Contractor shall offer code required fire alarm system inspection and maintenance contract.

1.02 QUALIFICATIONS

A. Equipment

- 1. This specification is based on the equipment of manufacturer(s) who have been approved by the Owner and the Manufacturer(s) herein named shall be considered as meeting the requirements of this specification.
- 2. The equipment manufacturer shall be a United States manufacturer, who has been regularly engaged in the manufacture of fire alarm systems for at least ten (20) years.
- 3. The district has an existing Lifeguard Networks Automation and Control system. The fire alarm contractor shall integrate the new system with the Automation and Control system. The fire alarm contractor shall be a certified Lifeguard Networks dealer.
- 4. It is the Contractor's responsibility to meet the entire intent of these specifications. Deviations from the specified items shall be at the risk of the Contractor until the date of final acceptance by the Architect, Engineer and the Owner's representative.
- 5. All equipment shall conform to applicable codes and ordinances.
- 6. All equipment shall be California State Fire Marshal (CSFM) listed.
- 7. All equipment shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as Intertek Testing Services NA, Inc. (ITSNA - formerly ETL) or Underwriters Laboratories Inc. (UL) and be listed by their re-examination service.

B. System Supplier/Installer

- 1. The system shall be provided and installed by a Gamewell-FCI Elite Partner and Lifeguard Networks Authorized Distributor who is trained and certified by the Manufacturer in the proper installation, programming, configuration, testing, service and maintenance of each system.

2. Subsequent to a successful bid and upon request of the Owner the System Supplier/Installer shall submit a qualification documentation package which shall include the following:
 - a) Underwriters Laboratories (UL) listing indicating current status as a UL Listed Central Station Fire Service – Local Service (UUFX-L) Installation Company.
 - b) Evidence of current status as the Gamewell-FCI Elite Partner. The evidence shall be a letter from Gamewell-FCI stating the system provider's authenticity as a dealer and specifically mention this project in the body of the letter. The letter must contain contact information so that the owner can verify.
 - c) Certificates indicating that a minimum of four (4) technicians have attended and completed all requirements and received certification from the manufacturer's installation and service school.
 - d) Evidence of current status as the Lifeguard networks Authorized Distributor. The evidence shall be a letter from Lifeguard Networks stating the system provider's authenticity as a dealer and specifically mention this project in the body of the letter. The letter must contain contact information so that the owner can verify.
 - e) Evidence of current State of California Contractor's License, C-10.
 - f) Evidence of current State of California Alarm Company Operator License, ACO.
 - g) A list of twenty (20) completed projects of equal scope, with associated Owners Representative contact names and telephone numbers.
 - h) A minimum of four (4) National Institute for Certification in Engineering Technologies (NICET) certificates in "Fire Protection Engineering Technology – Fire Alarm Systems". NICET certificates shall include at a minimum one (1) Level 3 and two (2) Level 2.
3. Per California codes all individuals involved in the installation of the fire alarm system shall hold a valid State of California, Division of Apprenticeship Standards (DAS), Fire/Life Safety Technician Certification.
 - a) Evidence of DAS certification shall be provided immediately upon request at the project site.

4. The System Supplier/Installer shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection, service and maintenance of the system.
 - a) The System Supplier/Installer shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.
5. The System Supplier/Installer shall be prepared to offer a service contract for the maintenance of the system beyond the warranty period.
6. The System Supplier/Installer shall be an established fire alarm systems contractor that has a minimum of (2) offices in Southern California, currently maintains a locally run office (within 100 miles of the job site), and operated business for at least forty (40) years.
7. The System Supplier/Installer shall employ a minimum of five (5) Gamewell-FCI factory trained technicians and maintain a 24 hour emergency service department.
8. The System Supplier/Installer shall designate one person to act as the project manager having total responsibility for coordination, communications and project technical integrity. This project manager shall have a minimum of five (5) years experience as a supervisor and installer of the system specified herein.

1.03 RELATED SPECIFICATIONS

- A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the Division 1 - General Requirements specifications are hereby made a part of this Section.
 1. Section 26 05 00 – Common Work Results for Electrical
 2. Section 26 05 05 – Basic Electrical Materials and Methods
 3. Section 26 05 30 – Conduit and Wire

1.04 RELATED WORK BY OTHERS

- A. Reference Part 3, sub-section 3.01 of this specification.

1.05 RELATED DOCUMENTS

- A. In the event of a conflict between this specification and the construction drawings this specification shall take precedence.

1.06 APPLICABLE CODES & STANDARDS

- A. 2016 Building Standards Administrative Code.
- B. 2016 California Building Code (CBC).
- C. 2016 California Electrical Code (CEC).
- D. 2016 California Mechanical Code (CMC).
- E. 2016 California Plumbing Code (CPC).
- F. 2016 California Fire Code (CFC).
- G. NFPA Standards
 - 1. The fire alarm system shall comply with the applicable provisions of the following current National Fire Protection Association (NFPA) standards:
 - a) NFPA 12 Carbon Dioxide Extinguishing Systems
 - b) NFPA 12A Halon 1301 Fire Extinguishing Systems
 - c) NFPA 13 Installation of Sprinkler Systems
 - d) NFPA 15 Water Spray Fixed Systems
 - e) NFPA 16 Deluge Foam-Water Sprinkler Systems
 - f) NFPA 16A Installation of Closed Head Foam-water Sprinkler Systems
 - g) NFPA 17 Dry Chemical Extinguishing Systems
 - h) NFPA 17A Wet Chemical Extinguishing Systems
 - i) NFPA 70 National Electrical Code
 - j) NFPA 72, National Fire Alarm Code:
 - a) Central Station Fire Alarm Systems
 - b) Local Fire Alarm Systems

- c) Auxiliary Fire Alarm Systems
 - d) Remote Station Fire Alarm Systems
 - e) Proprietary Fire Alarm Systems
- k) NFPA 90A, Installation of Air Conditioning and Ventilating Systems
- l) NFPA 101, Life Safety Code - Safety to Life from Fire in Buildings and Structures
- m) NFPA 750 Water Mist Fire Protection Systems
- n) NFPA 2001 clean Agent fire Extinguishing Systems
- H. ADA - Americans with Disabilities Act
- I. CAC – California Administrative Code, Title 24
- J. U.L. Standards
 - 1. The system shall comply with the applicable provisions of the following U.L. Standards and Classifications:
 - a) UL 268, Smoke Detectors for Fire Alarm Signaling Systems
 - b) UL 464, Audible Signal Appliances
 - c) UL 521, Heat Detectors for Fire Protective Signaling Systems
 - d) UL 864, Control Units for Fire Protective Signaling Systems
 - e) UL 1481 Power Supplies for Fire Alarm Systems
 - f) UL 1971, Emergency Devices for the Hearing Impaired
 - g) UOJZ, Control Units, System
 - h) SYZV Control Units, Releasing Device
 - i) UOXX, Control Unit Accessories, System
 - j) SYSW Accessories, Releasing Device Service

1.07 SUBSTITUTIONS

- A. The Fire Alarm System shall be Gamewell-FCI (Fire Control Instruments). No substitutions shall be approved.

SUBMITTALS

- A. Within thirty-five (30) calendar days after the date of the award of the contract, the Contractor shall submit to the Architect for review, one electronic and two hard copies of a complete Submittal Package. The Submittal Package shall consist of the following sections, with each section separated with index tabs.
1. Title Page
 - a) Project Title
 - b) Project address
 - c) Architect's name and address
 - d) Contractor's name and address
 2. Index of Submittal Contents
 - a) Each Section of the Submittal Package shall be numbered chronologically and shall be summarized in the Index.
 3. Certifications
 - a) Index of Certification Section Contents
 - b) Valid State of California Contractors License
 - c) Manufacturer's Certifications
 - a) Authorized Distributor
 - b) Factory Trained Technician
 - d) UL (Underwriters Laboratories Inc.) Listing
 - e) NICET Certifications
 - f) California DAS, Fire/Life Safety Technician Certifications

4. Project List

- a) A substantial list (minimum of 20) of completed projects equal in scope to that specified herein.

- a) Contact information shall be made available upon request.

5. Product Data

- a) Index of Equipment Data Sheets
- b) Manufacturer's Data Sheets including cable types
- c) Applicable Listings and Approvals
- d) Copy of Manufacturer's 5-year warranty

6. Shop Drawings

- a) plans.
- b) Shop drawings shall be required only if design changes are being suggested that differ for the DSA approved set of plans.

PART 2 PRODUCTS

2.01 SYSTEM REQUIREMENTS

A. Basic Performance

- 1. The fire detection and alarm system shall continually supervise and monitor the integrity of conductors: initiating device circuits (IDC); notification appliance circuits (NAC); and signaling line circuits (SLC); per the requirements of NFPA 72.
 - a) Loss of signal from any of these circuits will activate a trouble indication, both audible and visual, at the local FACP.
- 2. The system shall be microprocessor based operating system having the following; capabilities, features and capacities:
 - a) Two intelligent loops expandable to four (4) with supplemental loop module.
 - b) Capability of 159 analog addressable sensors and 159 addressable modules per SLC intelligent loop, as a minimum.
 - c) Intelligent devices shall operate on "standard wire" no special twist or shield shall be required

- d) Two (2) 24V DC 2A notification circuits capable of Style Z (Class A) or Style Y (Class B)
 - e) Optional relays or LED drivers for graphic annunciation.
 - f) Remote graphic annunciator (NGA) with Microphone.
 - g) DACT capable of sending point information to a Central Station depending on protocol required by the Central Station.
 - h) 80-character backlit LCD display.
 - i) Loss of signal from any of these circuits will activate a trouble indication, both audible and visual, at the local FACP.
- 3. System shall be fully programmable and configurable on site to accommodate system expansions and facilitate changes in operation.
 - 4. All software programs shall be stored in non-volatile programmable memory within the FACP.
 - a) Loss of primary and secondary power shall not erase the instructions stored in the memory.
 - b) System programming shall be password protected.
 - 5. Alarm, supervisory and trouble signals from analog addressable devices shall be encoded onto NFPA Style 4 (Class B) signaling line circuits (SLC).
 - 6. Initiation device circuits (IDC) shall be wired NFPA Style B (Class B)
 - 7. Notification appliance circuits shall be wired NFPA Style Y (Class B).
 - 8. A single ground or open on any system SLC, IDC or NAC shall not cause a system malfunction, loss of operating power or the ability to report an alarm.
 - 9. Alarm signals arriving at the main FACP shall not be lost due to a power failure.
 - 10. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of 120 VAC power in a normal supervisory mode for a period of twenty four (24) hours with five (5) minutes of alarm indication at the end of this period.

- a) Systems that include voice evacuation shall provide sufficient battery capacity for twenty-four (24) hours with fifteen (15) minutes of alarm in lieu of the five (5) noted above.
11. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70% capacity in twelve (12) hours.

B. System Functional Operation

- 1. The actuation of any approved alarm initiating device shall automatically initiate the following functions:
 - a) Alarm LED on the FACP shall flash.
 - b) Local audible piezo electronic signal in the FACP shall sound.
 - c) The alarm condition description, including the type of point and the location within the protected premises, shall be displayed on the LCD display at the FACP and any remote annunciator(s).
 - d) System shall transmit the condition to a UL Listed Central Station monitoring facility. Supervising station shall be approved per 2016 CFC.
 - e) Printing and history storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence.
 - f) System output programs configured via control-by-event (CBE) programming to be activated by the particular point in alarm shall be executed, and the associated system output (alarm notification appliances and relays) shall be activated on either local outputs or points located on other network nodes.
- 2. The actuation of any approved supervisory alarm initiating device shall automatically initiate the following functions:
 - a) Supervisory LED on the FACP shall flash.
 - b) Local audible piezo electronic signal in the FACP shall sound.
 - c) The supervisory condition description, including the type of point and the location within the protected premises, shall be

displayed on the LCD display at the FACP and any remote annunciator(s).

- d) System shall transmit the condition to a UL Listed Central Station monitoring facility. Supervising station shall be approved per 2010 CFC.
 - e) Printing and history storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence.
 - f) System output programs configured via control-by-event (CBE) programming to be activated by the particular point in alarm shall be executed, and the associated system output (alarm notification appliances and relays) shall be activated on either local outputs or points located on other network nodes.
3. Whenever a trouble condition is detected and reported the FACP shall automatically initiate the following functions:
- a) Trouble LED on the FACP shall flash.
 - b) Local audible piezo electronic signal in the FACP shall sound.
 - c) The trouble condition description, including the type of point and the location within the protected premises, shall be displayed on the LCD display at the FACP and any remote annunciator(s).
 - d) System shall transmit the condition to a UL Listed Central Station monitoring facility. Supervising station shall be approved per 2010 CFC.
 - e) Printing and history storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence.
 - f) System output programs configured via control-by-event (CBE) programming to be activated by the particular point in alarm shall be executed, and the associated system output (alarm notification appliances and relays) shall be activated on either local outputs or points located on other network nodes.

C. Remote Monitoring Connection

1. The fire alarm system shall be connected via Digital Alarm Communicator Transmitter (DACT) over telephone lines to a UL Listed Central Station Monitoring Company.
 - a) The fire alarm control panel shall provide an integral Digital Alarm Communicator Transmitter (DACT) for signaling to a UL Listed Central Station Monitoring Company. The DACT shall contain a "Dialer-Runaway" feature preventing unnecessary transmissions as the result of intermittent faults in the system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers.
 - b) The fire alarm system shall transmit alarm, supervisory alarm and trouble signals with the alarms having priority over the trouble signal.

D. Internet Protocol (IP) Connectivity for Remote Access

1. The system shall be capable of remote access via LAN/WAN network.
 - a) Remote access features and functions shall include the following:
 - a) Perform programming of the main processor including all system features and functions noted elsewhere in this specification.
 - b) The capability to perform system diagnostics and access integral system report software regarding the current system status.
 - b) External Device Server
 - a) Shall support RS-232, RS-422 and RS-485 serial connections
 - b) Shall configure via HTTP, DHCP, Telnet or serial
 - c) Shall be capable of Flash ROM upgrades
 - d) Network Interface – (10Base-T or 10Base-T/100Base-TX) Ethernet
 - e) Serial Interface – DB25F, RS-232/RS-422/RS-485 serial port with DCE configuration.
 - f) Shall be capable of modem emulation and accept modem AT commands on the serial port to establish a network connection to the system.

2. The contractor shall provide all active electronics, software and peripheral equipment for a complete and operable system.
 3. Systems not capable of remote access requirements of this specification will not be considered acceptable.
- E. Centralized Integration and Control System – LifeGuard Networks IP Based Building Automation and Control System
1. The contractor shall furnish and install a complete integration/expansion of the existing LifeGuard Networks IP Based Building Automation and Control System.
 - a) The Contractor shall provide all equipment and labor to integrate the new Fire Alarm Controls with the existing District's control server for a complete and operable system. This shall include the following:
 - a) Provide and install a LifeGuard Networks SY-MTIP IP GatewayAll necessary modifications, programming and upgrades to the existing SY-FSERX server software.
 2. System features
 - a) Communication protocols include RS-485, RS-232, Cellular, Analog Digital, and 2 way audio.
 - b) Serial interface to addressable FACP and/or dry contacts for conventional fire panels.
 - c) Fourteen (14) inputs and eight (8) programmable outputs
 - d) Complete system monitoring and transmission of data via existing network including event based unlimited email notification, itemized system monitoring of each device, wiring and peripherals. System control and response based upon event data.
 - e) Redundant buffer and onboard 2 gigabyte storage
 - f) VOIP Telephony connection of all networked devices
 - g) Six (6) onboard video ports with expansion to twelve (12) with motion control, remote PTZ and remote view.
 - h) Standard 2 Gigabyte memory with expansion capability to 500 Terabytes
 - i) Embedded Script language with logic control

3. The fire alarm system installing contractor shall employ the services of a certified LifeGuard Networks system installer to install, train district personnel and maintain all current system warranties. Contact LifeGuard Networks at (978) 212-1312 for local authorized service company.

2.02 SYSTEM COMPONENTS

A. Fire Alarm Control Panel (FACP)

1. Gamewell-FCI E3 Series

- a) California State Fire Marshal (CSFM) Listing No. 7165-1703:0125

- b) System Cabinet & Inner Door

- a) Gamewell-FCI – Model No. E3BB-RD & E3ID2-D

(a) The system cabinet shall be either surface or semi-flush mounted with a texture finish and shall consist of a back box, an inner door and a door. The cabinet shall be of dead-front steel construction with an inner door to conceal any internal circuitry and wiring. A minimum of a 1-inch wiring gutter space shall be provided behind the mounting plate. Wiring shall be terminated on removable terminal blocks to allow field servicing of all modules without disrupting system wiring.

- c) Intelligent Loop Interface (Motherboard)

- a) Gamewell-FCI – Model No. ILI-MB-E3

(a) The system shall be of multiprocessor design to allow maximum flexibility of capabilities and operation.

- (b) Field Programmable

(1) The system shall be capable of being programmed by means of a Field Configuration Program (FCP) allowing programming to be downloaded via portable computer from any node on the network.

- (c) RS-232C Serial Output

(1) A supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals,

accept a downloaded program from a portable computer, or provide 80 column readout of all alarms, troubles, location descriptions, time, date, etc. The communication shall be standard ASCII code operating from 1200 to 115,200 baud rate.

(d) RS-485 Serial Output

- (1) Each ILI-MB-E3 shall incorporate an RS-485 bus via a ribbon harness for connection of modules inside the same cabinet, and via a four wire quick connector for connection of modules up to 3000 feet from the cabinet. This RS-485 bus shall support up to sixteen (16) ASM-16 auxiliary switch modules, six (6) LCD-E3 main Annunciators and five (5) LCD-7100 annunciators.

(e) Peer-to-Peer panel configuration.

- (1) All Loop Interface Modules shall incorporate its own programming, log functions, Central Processor Unit, and control by event (CBE) programming. In the event that any loop becomes disabled, each remaining loop driver shall continue to communicate with the remainder of the network and maintain normal operation. "Degrade" configurations under these conditions are not acceptable.

(f) Control-by-Event (CBE) Program

- (1) The ILI-MB-E3 shall be capable of programming using Boolean logic including AND, OR, NOT, and TIMING functions to provide complete programming flexibility.

(g) Alarm Verification

- (1) Smoke detector alarm verification shall be a standard option while allowing other devices (i.e.: manual stations, sprinkler flow, etc.) to create an immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.

(h) Alarm Signals

- (1) All alarm signals shall be automatically latched or "locked in" at the control panel until the operated device is returned to normal and the control panel is manually reset. When used for sprinkler flow, the "SIGNAL SILENCE" switch may be bypassed, if required by the AHJ.

(i) Electrically Supervised

- (1) Each SLC and NAC circuit shall be capable shall be electrically supervised for opens, shorts and ground faults. The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any other circuit.
- (2) A yellow "SYSTEM TROUBLE" LED'S shall light and the system audible sounder shall steadily sound when any trouble is detected in the system. Failure of power, open or short circuits on the SLC or NAC circuits, disarrangement in system wiring, failure of the microprocessor or any identification module, or system ground faults shall activate this trouble circuit. A trouble signal may be acknowledged by operating the "TROUBLE ACKNOWLED' SGE" switch. This shall silence the sounder. If subsequent trouble conditions occur, the trouble circuitry will resound. During an alarm, all trouble signals shall be suppressed with the exception of lighting the yellow "SYSTEM TROUBLE" LED'S.

(j) Drift Compensation - Analog Smoke Sensors

- (1) System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to the effects of component aging or environment (i.e.: dust). Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring the factors which generally contribute to nuisance alarms. The system trouble circuitry shall activate, display "DIRTY DETECTOR" and "VERY DIRTY DETECTOR" indications and identify the individual unit that requires maintenance.

(k) Analog Smoke Sensor Test

- (1) System software shall automatically test each analog smoke sensor a minimum of three times daily. The test shall be a recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of a sensor shall activate the system trouble circuitry, display a "Test Failed" indication, and identify the individual device that failed.

(l) Off-Premises Connection

- (1) The fire alarm system shall be connected via Digital Alarm Communicator Transmitter (DACT) and telephone lines to a central station or remote station. The panel shall contain a disconnect switch to allow testing of the system without notifying the fire department.

(m) Central Station Option

- (1) The fire alarm control panel shall provide an integral Digital Alarm Communicator Transmitter (DACT) for signaling to a Central Station. The DACT shall contain a "Dialer-Runaway" feature preventing unnecessary transmissions as the result of intermittent faults in the system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. The fire department shall be consulted as to the authorized central station companies serving the municipality. The fire alarm system shall transmit both alarm and trouble signals with the alarm having priority over the trouble signal. The contractor shall be responsible for all installation charges, while the customer shall be responsible for the line lease charges.

(n) Network Annunciator Option

- (1) Each ILI-MB-E3 and associated display shall provide the option of being configured as a network annunciator. The options for annunciation shall default as a regional annunciator with the capability of selecting global annunciation to provide system wide protection as well as Acknowledge, Silence, and Reset capabilities.

(o) Redundant History Log

- (1) Each ILI-MB-E3 shall contain a full 4100 event history log supporting local and network functions. In the event that a main processor or network node is lost the entire log shall be accessible at any other Loop Interface board.

(p) LED'S Indicator and Outputs

- (1) Each ILI-MB-E3 Loop Interface shall incorporate as a minimum the following Diagnostic LED'S indicators:
 - (2) Power (green)
 - (3) Alarm (red)
 - (4) Supervisory (yellow)
 - (5) General Trouble (yellow)
 - (6) Ground Fault (yellow)
 - (7) Transmit (green)
 - (8) Receive (green)

(q) Auxiliary Power Outputs

- (1) Each ILI-MB-E3 Loop Interface shall provide the following supply outputs as follows:
 - (2) 24 VDC Non-resettable, 1 amp. max., power limited.
 - (3) 24 VDC Resettable, 1 amp. max., power limited.

(r) Microprocessor

- (1) The Loop interface shall incorporate a 32 bit RISC processor. An isolated "watchdog" circuit shall monitor the microprocessor and upon failure shall activate the system trouble circuits on the display. The microprocessor shall access the system program, for all control-by-event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power. Programming

shall supporting Boolean logic including AND, OR, NOT, TIME DELAY functions for maximum flexibility.

(s) Auto Programming

- (1) The system shall provide means for all SLC devices on any SLC loop to be pre-programmed into the system. Upon activation of auto programming, only the devices that are present will activate. This allows for a system to be commissioned in phases without the need of additional downloads.

(t) Environmental Drift Compensation

- (1) The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.

(u) One-Man Walk Test

- (1) The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.
- (2) This test feature is simply intended to provide for certain random spot testing of the system and is not intended to comply with the requirements of testing fire alarm systems in accordance with NFPA 72, as it is impossible to test all of the

functions and verify things such as annunciation with only one person.

(v) Signaling Line Circuits

- (1) Each ILI-MB-E3 module shall provide communication with all analog/addressable (initiation/control) devices via two (2) signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. The circuits shall be capable of operating in an NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of ninety-nine (99) analog sensors and ninety-eight (99) addressable monitor/control devices. A unique 40 character identifier shall be available for each device. The devices shall be of the Velocity series with the capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLC's are fully loaded.

(w) Notification Appliance Circuits

- (1) Two (2) independent NAC circuits shall be provided on the ILI-MB, polarized and rated at 2 amperes DC per circuit, individually over current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y, or Class A, Style Z.

(x) Alarm Dry Contacts

- (1) Alarm dry contacts (Form C) shall be provided and shall be rated 2 amps @ 30 VDC (resistive) and shall transfer whenever a system alarm occurs.

(y) Supervisory Dry Contacts

- (1) Supervisory dry contacts (Form C) shall be provided and shall be rated 2 amps @ 30 VDC (resistive) and shall transfer whenever a system Supervisory condition occurs.

(z) Trouble Dry Contacts

- (1) Trouble dry contacts (Form C) shall be provided and shall be rated at 2 amps @ 30 VDC (resistive) and shall transfer whenever a system trouble occurs.
- d) Intelligent Loop Interface (Supplementary board) – Optional
 - a) Gamewell-FCI – Model No. ILI-S-E3
 - (a) Signaling Line Circuits
 - (1) Each ILI-S-E3 module shall provide communication with analog/addressable (initiation/control) devices via two (2) additional signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. The circuits shall be capable of operating in an NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of ninety-nine (99) analog sensors and ninety-eight (99) addressable monitor/control devices. A unique 40 character identifier shall be available for each device. The devices shall be of the Velocity series with the capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLC's are fully loaded.
- e) Power Supply Module
 - a) Gamewell-FCI – Model No. PM-9
 - (a) The PM-9 power supply shall use the latest technologies to provide power to the INCC and shall incorporate the following features:
 - (1) Power saving switching technology using no step-down transformers
 - (2) 9 Amp continuous rated output to supply up to all power necessary under normal and emergency conditions for INCC Command Center Modules
 - (3) Integral Battery Charger with capacity to charge up to 55 amp-hour batteries while under full load.
- f) Voice Gateway Module

a) Gamewell-FCI – INI-VGX

(a) The INI-VGX shall incorporate the following features:

- (1) Support up to 150 watts of audio power thru the use of AM-50 series amplifiers
- (2) Support up to 16 switch modules for a total of 256 switches
- (3) Support for 16 messages with up to a 3 minute duration

g) Amplifier Module

a) Gamewell-FCI – AM-50

(a) The AM-50 shall incorporate the following features:

- (1) 50 watts at 25/70 Vrms per DSA plans
- (2) Two speaker circuits

h) LCD Display Module

a) Gamewell-FCI - Model No. LCD-E3

(a) The LCD display shall be an 80 character RS-485 based textual annunciator with the capability of being mounted locally or remotely. It provides audible and visual annunciation of all alarms and trouble signals. Dedicated LED's shall be provided for:

- (1) AC Power On (green)
- (2) Alarm (red)
- (3) Supervisory (yellow)
- (4) System Trouble (yellow)
- (5) Power Fault (yellow)
- (6) Ground Fault (yellow)
- (7) System Silenced (yellow)

(b) The 80-character alphanumeric display shall provide status of all analog/addressable sensors, monitor and control modules. The display shall be of the liquid

crystal type (LCD), clearly visible in the dark and under all light conditions.

(c) The panel shall contain four (4) functional keys:

- (1) Alarm Acknowledge
- (2) Trouble Acknowledge
- (3) Signal Silence
- (4) System Reset/Lamp Test

(d) The panel shall contain three (3) configuration buttons:

- (1) Menu/Back
- (2) Back Space/Edit
- (3) OK/Enter

(e) It shall also have a 12-key telephone style keypad which shall permit selection of functions.

i) Auxiliary Switch Module

a) Gamewell-FCI - Model. No. ASM-16

(a) Each ASM-16 has sixteen (16) programmable push-button switches.

(b) Each push-button switch has three (3) associated status LED's (red, yellow, green), configurable to indicate any combination of functions.

(c) Flexible switch configurations to allow flexible set-up of phone, speaker and auxiliary function circuits.

(d) An insertable label to identify the function of each switch and LED'S combination.

(e) Specialty modules that only perform one task such as Speaker, Phone, or Auxiliary are not acceptable.

j) Network Repeater Module

a) Gamewell-FCI – Model No. RPT-E3

(a) The Intelligent Network Interface shall provide interconnection and protection of remote network nodes. The repeater shall regenerate and condition the token passing, 625 k-baud signal between units. The Repeater shall be available in wire, fiber, or wire/fiber configurations as determined by field conditions.

(b) Fiber configurations shall utilize "ST" type connectors and be able to operate with up to 200-micron multi-mode fiber, but optimize for 62.5/125. The interface shall have a jumper to allow selection of ground detection of wiring when used in the wire mode. The interface shall have integral LED's to display current status of the board.

k) NGA Network Graphic Annunciator

a) Gamewell-FCI Model No. NGA

(a) The Network Graphic Annunciator shall be a networkable, 1/4 VGA, touch screen annunciator with the following Characteristics

(1) Custom Graphics: The panel shall permit uploading of a custom bit-mapped graphic to the display screen. Graphic shall display when all systems are normal

(2) Intuitive Functions: In an alarm or trouble condition, the annunciator shall display only the information pertaining to the event including control switches.

(3) In a trouble condition, the display shall indicate the cause of the trouble. The only controls available to the operator shall be the Acknowledge, and Reset functions.

(4) In alarm condition the display shall indicate cause of the alarm. The only controls available to the operator shall be Acknowledge, Silence, and Reset functions.

PART 3 Gamewell-FCI Focal Point - Command and Control System.

3.01 In addition to the existing Focal Point Command and Control System, provide one new Gamewell-FCI Focal Point Command and Control System.

- 3.02 System shall be U.L. listed.
- 3.03 System shall include the U.L. workstation.
- 3.04 Provide one touch screen monitor with the system.
- 3.05 System shall be installed and programmed at an off-site location.
- 3.06 Location to be determined post bid.
- 3.07 Configure system and software for offsite application.
- 3.08 Provide integration with existing Focal Point system
- 3.09 New system shall incorporate all existing Graphic Mapping from original system.
- 3.10 Provide control functionality of all existing Gamewell-FCI systems.
- 3.11 Setup to include all network configuration at the local and off site locations.
- 3.12 Provide backup capabilities for system screens, user, and history databases.
- 3.13 Provide labeling as directed by owner. Coordinate custom labels and locations with owner, i.e. HAZMAT, handicapped accessible areas, and gas/electric shutoffs.

A. CENTRALIZED AUTOMATION AND CONTROL SYSTEM

1. IP Gateway

- a) LifeGuard Networks - Model No. SY-MTIP
 - a) Communication protocols include RS-485, RS-232, Cellular, Analog Digital, and 2 way audio.
 - b) Serial interface to addressable FACP and/or dry contacts for conventional fire panels.
 - c) Fourteen (14) inputs and eight (8) programmable outputs
 - d) Complete system monitoring and transmission of data via existing network including event based unlimited email notification, itemized system monitoring of each device, wiring and peripherals. System control and response based upon event data.
 - e) Redundant buffer and onboard 2 gigabyte storage
 - f) VOIP Telephony connection of all networked devices
 - g) Six (6) onboard video ports with expansion to twelve (12) with motion control, remote PTZ and remote view.
 - h) Standard 2 Gigabyte memory with expansion capability to 500 Terabytes
 - i) Embedded Script language with logic control

- 2. The fire alarm system installing contractor shall employ the services of a certified LifeGuard Networks system installer to install, train district personnel and maintain all current system warranties. Contact LifeGuard Networks at (978) 212-1312 for local authorized service company.

B. ADDRESSABLE MODULES

1. Addressable Monitor Module

- a) Gamewell-FCI – Model No. AMM-2F
 - a) California State Fire Marshal (CSFM) Listing No. 7300-1703:0102
 - b) An addressable monitor module with an initiating circuit wired Class B, Style B shall be furnished to provide an

address for individual, normally open (N.O.) contact devices.

2. Addressable Output Module

a) Gamewell-FCI – Model No. AOM-2RF

a) California State Fire Marshal (CSFM) Listing No. 7300-1703:0102

b) An addressable output module shall be connected to the same signaling line circuit as the analog/addressable monitor devices and shall provide a relay output (Form "C" 2 amp @ 24 VDC, resistive only).

C. INITIATING DEVICES

1. Addressable Sensors

a) Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. The LEDs shall pulse periodically indicating that the sensor is receiving power and communication is taking place. This feature shall be field programmable. Upon alarm, these LEDs shall light continuously. An alarm output shall be available for remote annunciation.

b) Each sensor shall be interchangeable with all other spot type addressable sensors via twistlock mounting base, to ensure matching the proper sensor to the potential hazards of the areas being protected. In all cases the system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

c) Analog Photoelectric Smoke Sensors

a) Gamewell_FCI – Model No. MCS-COF3

(1) California State Fire Marshal (CSFM) Listing No. 7272-1703:0508

(2) Operating Temperature: 32° F to 100° F (0° C to 38° C)

(3) Air Velocity: 0 to 4000 ft./min (0 to 1219.2 m/min)

(4) Operating Humidity: 15% to 90% Relative Humidity, Non-condensing.

- (5) Maximum recommended spacing in low airflow applications on smooth ceilings is 30'. Follow manufacturer and NFPA requirements for actual conditions.
 - (6) Use compatible base to achieve Temp 3 for fire and Temp 4 for CO alarm indication.
- b) Gamewell-FCI – Model No. ASD-PL3
- (a) California State Fire Marshal (CSFM) Listing No.
7272-1703:0501
 - (b) Operating temperature rating: 32° F to 120° F (0° C to 49° C)
 - (c) Air velocity rating: 0-4000 ft./min. (suitable for installation in ducts)
 - (d) Relative humidity rating: 10-93% (non-condensing)
 - (e) Maximum recommended spacing in low airflow applications on smooth ceilings is 30'. Follow manufacturer and NFPA requirements for actual conditions.
 - (f) Analog photoelectronic sensors shall have a low profile and be capable of being set at four sensitivity settings of: "LOW, LOW MEDIUM, MEDIUM, MEDIUM HIGH, and HIGH" levels.
 - (g) Automatic and manual functional sensitivity and performance tests shall be possible without the necessity of generating smoke. This method shall test all sensor circuitry and a "Failed Test" indication shall display for any failed test.
 - (h) The system shall check the sensitivity of each sensor periodically. If a sensor alarm threshold sensitivity has changed, due to aging and/or dust accumulation, the system shall automatically compensate for this change (drift compensation).
 - (i) Each sensor shall allow for the setting of two sensitivity levels. These levels may be programmed so that when the building is occupied, a sensor will be less sensitive than when the building is unoccupied. This feature permits sensors to be more reliable and at the

same time reduces/minimizes unwanted alarms. This feature shall also provide for programmable weekend days, where the sensor will remain at an unoccupied sensitivity level.

- (j) The sensor screen and cover assembly shall be removable for field cleaning.
- (k) This method shall test all sensor circuitry and a "Failed Test" indication shall display for any failed test.
- (l) The system shall check the sensitivity of each sensor periodically. If a sensor alarm threshold sensitivity has changed, due to aging and/or dust accumulation, the system shall automatically compensate for this change (drift compensation).
- (m) Each sensor shall allow for the setting of two sensitivity levels. These levels may be programmed so that when the building is occupied, a sensor will be less sensitive than when the building is unoccupied. This feature permits sensors to be more reliable and at the same time reduces/minimizes unwanted alarms. This feature shall also provide for programmable weekend days, where the sensor will remain at an unoccupied sensitivity level.
- (n) The sensor screen and cover assembly shall be removable for field cleaning.

d) Addressable Thermal Sensor

a) Combination Rate-of-Rise and Fixed Temperature

(a) Gamewell-FCI – Model No. ATD-L3R / ATD-L3H Series

(1) California State Fire Marshal (CSFM) Listing No.

7270-1703:0502

(2) Operating temperature rating: -4° F to 100° F (-20° C to 38° C)

(3) Relative humidity rating: 10-93% (non-condensing)

(4) UL approved for 50 ft. center to center maximum spacing. Follow manufacturer and NFPA requirements for actual conditions

(5) Addressable thermal sensor shall have a low profile and operate on the combination "rate-of-rise" and "fixed temperature" principles

(i) Rate-of-rise detection threshold of 15° F (8.3° C) per minute

(ii) Fixed temperature set point: 135° F (57° C)

(6) The sensor shall contain dual thermistor sensing circuitry for fast response.

2. Non-addressable Detectors

a) Combination Fixed Temperature and Rate-of-Rise Heat Detector

a) System Sensor - Model No. 5602

b) California State Fire Marshal (CSFM) Listing No. 7270-1653:0167

c) 194°Fahrenheit fixed temperature rating

d) Maximum UL spacing of 50' x 50' on 10' high ceiling. Follow manufacturer and NFPA requirements for actual conditions

e) The detectors shall be installed, typically for use in non-sprinklered attic spaces, where indicated on the plans.

3. Manual Fire Alarm Stations

a) Addressable Fire Alarm Station

a) Gamewell-FCI – Model No. MS-7AF

b) California State Fire Marshal (CSFM) Listing No. 7150-1703:0119

c) Follow manufacturer and NFPA requirements for placement.

d) Furnish and install a manual station (MS-7AF) as indicated on the drawings. Each station shall be of the non-coded double action type and shall be designed for installation in the signaling line circuit of any GAMEWELL-FCI analog addressable control panel. Activation of the station shall cause its assigned address to register at the control

panel. The door shall contain an LED which flashes red in normal condition and lights steadily when the station has been activated. The station shall feature screw terminals.

D. NOTIFICATION DEVICES

1. Speaker – Outdoor Weatherproof

- a) System Sensor - Model No. SPRK
 - a) California State Fire Marshal (CSFM) Listing No. 7320-1653:0201
 - b) Rotary switch selection for voltage and power.
 - c) Shall be suitable for mounting on the wall.
 - d) Shall be surface mounted.
 - e) Finish shall be red.
 - f) All exterior mounted horns shall be weatherproof and shall be complete with weatherproof backbox.

2. Visual Strobe Appliance – Indoor Wall Mount

- a) System Sensor Model No. SRL/SCRL - Indoor Wall Mount
 - a) California State Fire Marshal (CSFM) Listing No. 7125-1653:0504
 - b) Shall operate on 24 VDC nominal.
 - c) Shall be capable of synchronization.
 - d) Shall be field selectable Multi-candela devices. To minimize spare parts stocking requirements, devices with single candela ratings will not be acceptable on this project.
 - (a) Field selectable candela ratings shall be 15, 30, 75 or 110.
 - (b) Intensity shall be as specified on the drawings.
 - e) Shall meet the requirements of the ADA and UL 1971.
 - (a) The maximum pulse duration shall be 2/10ths of one second

(b) The flash rate shall be one flash per every second.

f) Finish shall be red.

g) The appliance shall be semi-flush or surface wall mount as indicated on plans, locate appliance 80" above finish floor to bottom of device, or 6" below the ceiling, whichever is lower.

3. Combination Audible/Visual Horn/Strobe Appliance – Indoor Wall Mount

a) System Sensor - Model No. SPSRL/SPSCRL

a) California State Fire Marshal (CSFM) Listing No. 7125-1653:0188

b) Rotary switch selection for voltage and power.

c) Shall meet the requirements of Section 3 listed above for visibility.

d) Finish shall be red.

e) The appliance shall be semi-flush or surface wall mount as indicated on plans, locate appliance 80" above finish floor to bottom of device, or 6" below the ceiling, whichever is lower.

E. Accessory Equipment

1. Notification Appliance Circuit (NAC) Remote Power Supply

a) Gamewell-FCI – Model No. HFP-PS6

a) California State Fire Marshal (CSFM) Listing No. 7315-1637:0505

b) The Remote Power Supply is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

c) The Remote Power Supply shall offer up to 6.0 amps of regulated 24-volt power. It shall include an integral charger designed to charge sealed lead-acid storage batteries and to support 60-hour standby.

d) Four outputs shall be available for connection to the Notification devices. All four outputs shall be capable of

accommodating both Style Y (Class B) and Style Z (Class A) Notification Appliance Circuits.

- e) The Remote Power Supply shall include the ability to delay the AC fail delay per 1993 NFPA requirements.
- f) The Remote Power Supply shall provide integral synchronization and shall be capable of accommodating Audible and Visual devices, combined on each individual Notification Appliance Circuit, with the capability of silencing of Audible devices while Visual Devices remain in operation.

2. Isolation Relays

- a) Shall be utilized to provide interconnection between 24 VDC GAMEWELL-FCI Model No. AOM-2RF and 120 VAC electrical circuit.

CSFM #7300-1703:0102

3.14 CABLE/WIRE

- A. All fire alarm system cable and/or wire shall be run in conduit or raceways
- B. Signaling Line Circuit (SLC) and Annunciator data cable

1. Indoor dry location

- a) West Penn D990 or equal by Belden
 - a) California State Fire Marshal (CSFM) Listing No. 7161-0859:0101
 - b) 16/2 conductor cable, FPL rated, non-plenum, complete with red PVC jacket

2. Outdoor wet location

- a) Burton Cable Model No. 18JE2-0 or West Penn equal
 - a) California State Fire Marshal (CSFM) Listing No. 7161-1495:101
 - b) 16/2 conductor cable, FPL rated, complete with black underground/direct burial, sunlight resistant rated PVC jacket

- C. Initiating Device Circuit (IDC), Notification Appliance Circuit (NAC) and 24 volt DC auxiliary power
 - 1. Speaker circuits
 - a) West Penn D991 or equal by Belden
 - a) California State Fire Marshal (CSFM) Listing No. 7161-0859:0101
 - b) 18/2 conductor cable, FPL rated, shielded, non-plenum, complete with red PVC jacket
 - 2. All other locations
 - a) #12 AWG THHN/THWN
 - a) California State Fire Marshal (CSFM) listing not applicable

PART 4– EXECUTION

4.01 DIVISION OF WORK

- A. All equipment shall be installed in strict accordance with the manufacturer's installation documentation. Any deviation shall require the Contractor to correct the installation without impact to the construction schedule and at no additional cost to the Owner.
- B. While all work included under this specification is the complete responsibility of the contractor, the division of actual work listed following shall occur.
 - 1. All conduits with pull cords, all electrical pull boxes, grounding rods, all outlet boxes, terminal cabinets, backboards, etc., which form part of the rough-in work shall be provided and installed completely by the Electrical Contractor. Coordinate as required for proper installation.
 - 2. The balance of the system, including installation of initiating devices, notification appliances, cabling and equipment, making all connections, etc., shall be performed by the System Supplier/Installer (reference Part 1, Section 1.02 of this specification).
 - 3. All 120 VAC power conductors and conduits associated with power circuits to all low voltage system equipment locations shall be provided and installed by the Electrical Contractor.

4. An insulated stranded copper ground wire shall be provided from each equipment cabinet to the building grounding system, in compliance with CEC Article 250, by the Electrical Contractor.
5. Labeling of pullboxes and terminal cabinets shall be provided and installed by the Electrical Contractor.
 - a) All fire alarm junction boxes shall be painted red.

4.02 INSTALLATION

- A. All work shall be completed in strict accordance with all applicable codes and ordinances, by a Gamewell-FCI Elite Partner.
 1. Per California codes all individuals involved in the installation of the fire alarm system shall hold a valid State of California, Division of Apprenticeship Standards (DAS), Fire/Life Safety Technician Certification.
 - a) Evidence of DAS certification shall be provided immediately upon request at the project site.
 - a) Failure to provide evidence of DAS certification shall mandate immediate removal of said individual from the project site
- B. Cable/Wire
 1. All cable/wire for the fire alarm system shall be new, unless otherwise noted on plans.
 2. Raceways containing conductors serving the fire alarm system shall not contain any other conductors. No AC current carrying conductors shall be allowed in the same raceway with DC fire alarm system conductors.
 3. System cable/wire and equipment installation shall be in accordance with good engineering practices and in accordance with the California Electrical Code (CEC). All cable/wire shall test free from all grounds and shorts.
 4. All fire alarm system cable/wire shall be labeled at all points of termination. All labeling shall be based on the room numbers as provided by the Owner or his representative.
 5. Cable Shielding (for voice evacuation):
 - a) Cable shielding shall be connected to common ground at the main communications system terminal board and shall

be free from ground at any other point within the system. Cable shields shall be terminated in same manner as conductors.

6. Underground cables

a) Any cable/wire pulled through manholes or pullboxes located below grade shall be continuous with no splices. The cable/wire shall be intact with no cuts in the protective outer jacket.

b) Shall be approved for use in underground applications

4.03 SYSTEM START-UP

A. All start-up programming and system commissioning shall be performed by a Gamewell-FCI trained and certified technician.

4.04 SYSTEM VERIFICATION

A. Subsequent to system start-up the system installer shall perform a 100% pre-test to verify that the following features are functioning properly.

1. All notification appliances
2. All initiation devices
3. All control modules
4. All monitor modules
5. Communication link to monitoring service

4.05 ACCEPTANCE TESTING

1. The system installer shall, in the presence of the Owner's representative and the Inspector of Record (IOR), perform 100% testing as noted in System Verification above.

4.06 IN SERVICE TRAINING

A. The Contractor shall instruct personnel designated by the Owner in the proper use, basic care and maintenance of the system. Contractor shall provide up to eight hours of in-service training with this system.

4.07 FACTORY TRAINING & CERTIFICATION

A. The manufacturer shall provide factory certified training to two (2) fire alarm technicians employed by the school district. These technicians shall

be trained and certified as manufacturers certified technicians capable of performing any work on the system after the installation of the system.

- B. All cost for training including travel, lodging, meals and per diem shall be included in the Fire Alarm Contractor's bid for this project.

4.08 CONTRACT CLOSE-OUT DOCUMENTATION

- A. Contractor shall provide the following:
 - 1. One reproducible hard copy of project record drawings.
 - 2. One copy of manufacturer's maintenance and operation manuals.
 - 3. One copy of Contractor's system warranty
 - 4. One copy of Manufacturer's warranty
 - 5. One copy of the NFPA 72 Record of Completion

4.09 WARRANTY

- A. The Contractor shall warrant the equipment to be new and free from defects in material and workmanship, and will, within one year from the date of installation, repair or replace any equipment found to be defective.
 - 1. This warranty shall not apply to any equipment that has been subject to misuse, abuse, negligence or unauthorized modification.
- B. Equipment provided shall be complete with 7-year manufacturer's product warranty on Fire Alarm Control Panel.
 - 1. This warranty shall not apply to any equipment that has been subject to misuse, abuse, negligence or unauthorized modification.
 - 2. Manufacturer's warranty shall be provided with system submittal.

4.10 MANUFACTURER'S FIELD SERVICES

- A. The Gamewell-FCI Elite Partner shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system upon expiration of the initial warranty period.
- B. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

END OF SECTION 28 31 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aggregate base material.
- B. Installation standards.
- C. Spreading of material.
- D. Compacting.
- E. Field quality control.

1.2 RELATED SECTIONS

- A. Aggregate subbase for pavements and foundations is specified in Section 32 11 17 - Aggregate Subbase Courses.

1.3 CLASSIFICATION

- A. Aggregate bases are designated as Class 1 or Class 2. The class of aggregate base shall be as indicated.

1.4 MEASUREMENT AND PAYMENT

- A. General: Measurement and payment for aggregate base course will be either by the lump-sum method or by the unit-price method as determined by the listing of the bid item for aggregate base course indicated in the Bid Schedule of the Bid Form.

1.5 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
 - 2. ASTM D421 Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants
 - 3. ASTM D1241 Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses
 - 4. ASTM D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
 - 5. ASTM D2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate
 - 6. ASTM D2844 Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils
 - 7. ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - 8. ASTM D3017 Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - 9. ASTM D3744 Test Method for Aggregate Durability Index
- B. State of California, Department of Transportation (Caltrans), Standard Specifications, 1992 edition:
 - 1. Section 17 Watering
 - 2. Section 26 Aggregate Bases

1.6 SUBMITTALS

- A. General: Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.
- B. Product Data: Submit source, gradation, R-value, sand equivalent, and durability for the proposed base course material.
- C. Test Reports: Submit plant and field test reports as specified in Articles 2.02 and 3.05 herein.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE MATERIAL

- A. Aggregate for the two classes of aggregate bases at the time the base material is deposited on the prepared sub grade or sub base shall conform with ASTM D1241 and the following requirements:
 - 1. Class 1 Aggregate Base:
 - a. Class 1 aggregate base shall consist of crushed stone or gravel, free from vegetable matter and other deleterious substances. Aggregate shall consist of material of which 90 percent by weight shall be crushed particles. Composition of aggregate base, in percentages by weight, shall conform to one of the following gradings, determined in accordance with ASTM C136:

Percentage Passing Sieves

Sieve Sizes	1-1/2 inch Maximum	3/4-inch Maximum
2-inch	100	-----
1-1/2 inch	90-100	100
3/4-inch	50-85	90-100
No. 4	30-45	35-55
No. 30	10-25	10-30
No. 200	2-9	2-9

- b. Class 1 aggregate base shall conform to the following additional requirements:

ASTM Test

Tests	Method	Requirements
Resistance (R-Value)	D2844	80 min.
Sand Equivalent	D2419	50 min.
Durability Index	D3744	40 min.

2. Class 2 Aggregate Base:
- a. Class 2 aggregate base shall be free of vegetable matter and other deleterious substances. Coarse aggregate, material contained on the No. 4 sieve, shall consist of material of which 25 percent by weight shall be crushed particles. Class 2 aggregate base shall conform to one of the following gradings, determined in accordance with ASTM C136:

Percentage Passing Sieves

Sieve Sizes	1-1/2 inch Maximum	3/4-inch Maximum
2-inch	100	-----
1-1/2 inch	90-100	-----
1-inch	-----	100
3/4-inch	50-85	90-100
No. 4	25-45	35-55
No. 30	10-25	10-30
No. 200	2-9	3-9

- b. Class 2 aggregate base shall conform to the following additional requirements:

ASTM Test

Tests	Method	Requirements
Resistance (R-Value)	D2844	78 min.
Sand Equivalent	D2419	30 min.
Durability Index	D3744	35 min.

2.2 SOURCE QUALITY CONTROL

- A. The Contractor shall perform sampling and tests of the aggregate base material in accordance with the ASTM Test Methods herein specified, to determine compliance with specified requirements. Samples shall be taken from material as delivered to the site, and shall be prepared in accordance with ASTM D421, as applicable.
- B. Aggregate grading or sand equivalent test shall represent no more than 500 cubic yards of base course material or one day's production, whichever is the greater amount.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Contractor shall call for an inspection by the Engineer and obtain written acceptance of the prepared sub grade or sub base before proceeding with the placement of aggregate base course.
- B. The sub grade or sub base to receive aggregate base course, immediately prior to spreading, shall conform to the compaction and elevation tolerances indicated for the material involved and shall be free of standing water and loose or extraneous material.

3.2 INSTALLATION STANDARDS

- A. Aggregate base course shall be applied over the prepared sub grade or sub base and compacted in accordance with Section 26 of the Caltrans Standard Specifications.
- B. Aggregate base course shall have minimum uniform thickness after compaction of dimensions indicated. Where not indicated, compacted thickness shall be 6 inches.
- C. All compaction expressed in percentages in this section refers to the maximum dry density as determined by ASTM D1557.

3.3 SPREADING OF MATERIAL

- A. Aggregate for base course shall be delivered as uniform mixture of fine and coarse aggregate and shall be spread in layers without segregation.

- B. Aggregate base course material shall be free from pockets of large and fine material. Segregated materials shall be remixed until uniform.
- C. Aggregate base material shall be moisture-conditioned to near optimum moisture content in accordance with the applicable requirements of Section 17 of the Caltrans Standard Specifications.
- D. Aggregate base course 6 inches and less in thickness may be spread and compacted in one layer. For thickness greater than 6 inches, the base course aggregate shall be spread and compacted in two or more layers of uniform thickness not greater than 6 inches each.

3.4 COMPACTING

- A. Relative compaction of each layer of compacted aggregate base material shall be not less than 95 percent as determined by ASTM D1557.
- B. Thickness of finished base course shall not vary more than 3/4 inch from the indicated thickness at any point. Base that does not conform to this requirement shall be reshaped or reworked, watered, and recompact to achieve compliance with specified requirements.
- C. The surface of the finished aggregate base course at any point shall not vary more than 3/4 inch above or below the indicated grade.

3.5 FIELD QUALITY CONTROL

- A. The Contractor shall perform field tests in accordance with ASTM D2922 to determine compliance with specified requirements for density and compaction of aggregate base material, and with ASTM D3017 to determine moisture-content compliance of the installed base course.
- B. Testing frequency shall be not less than one test for every 2,000 square feet of base course material, per layer or lift.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. Asphaltic concrete paving.
- B. Patching existing pavement.
- C. Fill all cracks in existing paving.
- D. Surface sealer coats.
- E. Path to pedestrian areas shall comply with 11B - 302-1 and 11B - 303.

1.02 RELATED WORK

- A. Section 32 12 36.13 - Asphalt Pavement Seal Coat.
- B. Section 32 17 23.13 - Pavement Marking.

1.03 REFERENCES

- A. California Department of Transportation (CALTRANS), Division of Highways Standard Specifications, as last amended.
- B. Definitions: Paving and base Type designations.
 - 1. Type A: Areas taking automobile traffic.
 - 2. Type B: Areas taking bus and/or truck traffic and fire lanes.
 - 3. Type C: Areas taking pedestrian traffic (hard-court/play areas).
 - 4. Type E: Areas where paving is to be replaced. Refer to 3.06.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with CALTRANS Standard Specifications.
- B. Off-site work to conform to local governing agency requirements. Obtain and pay for required permits and licenses. Do required testing.
- C. Allowable Tolerances:
 - 1. Material Weights: Weights of base course and paving materials delivered to Site shall be computed as follows:
 - a. Asphalt Concrete Paving: 12 lbs/sf/inch of thickness.
 - b. Rock Base Course: 9-1/2 lbs/sf/inch of thickness.
 - 2. Paving Surface Smoothness: 3/8" maximum permissible from a true plane measured from 10' straight edge placed on surface non-cumulative.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

1.05 SUBMITTALS

- A. Submit product data.
- B. Submit test reports of field quality control tests.
- C. Submit Weighmaster's Certificates showing net weight of each load of base and paving materials.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Place asphalt when base surface temperature is above 40°F and dry, and when weather is stable.
- B. Do not commence work until installation of underground pipes and utilities is complete.

1.07 GUARANTEE

- A. In addition to guarantee specified in Contract Close-Out, Section 01700, the Contractor shall repair or restore to first class condition any portion of asphaltic paving and surface coating in which weed growth, creeping, shoving, cracking, delamination, raveling, softening, excessive or uneven settlement due to improperly compacted subgrade, or other defects due to improper placing or defective materials, become apparent within one (1) year from acceptance date by the District.
- B. Effectiveness of type of weed control is sole responsibility of the Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Weed Control:
 - 1. Herbicide: Only use of borates, sodium chlorate, or other nonpoisonous chemicals will be permitted.
 - 2. Option: The Contractor may, at his option and expense, use Nox-Weed 310 emulsion.
- B. Base Course: Untreated rock using a pit run unwashed stream bar material, crusher run material, or blend of commercial products; graded as follows:
 - 1. Class 2 Aggregate Base, per Section 26, CALTRANS Standard Specifications.
 - 2. Mixing: Thoroughly blend material by blading or other suitable means.
- C. Asphalt Concrete Paving:
 - 1. General: CALTRANS Standard Specifications, except as modified herein.
 - 2. Asphalt: 40 or 50 penetration.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

3. Aggregate: Graded mix as follows:

TOTAL PERCENTAGE PASSING SIEVES

<u>Sieve Size</u>	<u>Percentage</u>
3/4"	100%
1/2"	90%-100%
3/8"	74%-89%
No. 4	53%-67%
No. 8	40%-50%
No. 30	20%-30%
No. 200	3%-8%
Paving Asphalt	5-1/2 % to 7% by weight of total mix.

4. Mixing: Plant mix aggregate and asphalt, to produce a dense mixture with minimum of voids, per Section 39, CALTRANS Standard Specifications.
- D. Surface Seal Coat For All Paving Areas:
1. Meet Green Book, Specification No. 203-9-Seal Coat Asphalt Base.
 2. Sealer shall be Ove Kote Asphalt Pavement Coating by Diversified Asphalt Products or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Subgrade Preparation: After areas are brought to approximate required subgrade, finish by scarifying to depth of 3", moistening and rolling with a self-propelled tandem roller, weighting 8 tons minimum, until surface is firm and unyielding. Bring any depressions and high areas to required grade by scarifying, filling or cutting, and rolling to density and stability of adjoining material.
- B. Weed Control: Just prior to paving work, apply herbicide to earth as per manufacturer's printed recommendations.
- C. Coat surfaces of manhole catch basin metal surface frames with oil to prevent bond with asphalt paving.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

3.03 INSTALLATION - BASE COURSE

- A. Spread to uniform thickness; water and roll until firm enough to support material trucks without displacement or rutting.
- B. Compacted Thicknesses:
 - 1. Type A Areas: 7." Parking lots.
 - 2. Type B Areas: 12". Fire Lane.
 - 3. Type C Areas: 3". Sidewalk/Hardcourt
 - 4. Type E Areas: 3" minimum. Paving Replacement refer to Paragraph 3.06.
- C. Density Required: 90% minimum.

3.04 INSTALLATION - PAVEMENT WEARING COURSE

- A. General: Conform to Section 39, CALTRANS Standard Specifications.
- B. Placing: Spread to headers and/or temporary screeds, where required, with Barber-Greene self-propelled mechanical spreading and finishing equipment, or Architect-approved equal. Hand spread only in places inaccessible to mechanical spreader. Heat shovels, forks and rakes.
- C. Edges: At headers, lay to a thickness 4" deep x 8" wide at bottom, forming a footing. Slope bottom up 3:1 to meet typical paving thickness. Where paving stops against buildings, walls, curbs, or concrete walks, thickened edges are not required.
- D. Abutting Work: Where paving contacts rigid structures, thoroughly clean and coat contact surfaces with a film of asphalt emulsion and/or asphalt cement. Protect adjoining work from spotting and splashing or asphalt materials.
- E. Rolling and Smoothness: Roll per Section 39, CALTRANS Standard Specifications. Finished surface to be even, smooth, of uniform texture free of roller welts, true to place and line, and drain as indicated. Paving to have a density such that water will not penetrate.
- F. Compacted Paving Thicknesses:
 - 1. Type A Areas: 3". Parking Lot
 - 2. Type B Areas: 3.5". Fire Lane
 - 3. Type C Areas: 3" Sidewalk/Hardcourt.
 - 4. Type E Areas: 3" minimum. Paving replacement refer to Paragraph 3.06.

3.05 APPLICATION - SURFACE SEAL

- A. Refer to Specification Section 32 12 36.13, Asphalt Pavement Seal Coat/Crack Filler.
- B. Preparation:
 - 1. Clean paving surface removing all loose, foreign materials.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

2. Contractor shall exercise one of the following procedures:
 - a. Remove existing concrete parking bumpers prior to seal coat application and replace all bumpers on the original manner after curing period.
 - b. Mask all bumpers completely to prevent seal coat from splashing onto bumpers.
 3. Preventive measures shall be taken to protect existing concrete surfaces including curbs, walks, light pole mounting piers, etc, from over-splash by seal coat.
- C. Application:
1. Per manufacturer's recommendations.
 2. Mix into a slurry with three to six lbs. of sand per gallon of sealer.
 3. Protect adjacent structures from mixture.
 4. **Apply evenly in two coats.** Spread immediately with rubber-faced squeegees; pull at angle from line of spread, to roll material toward operator. After each coat has dried, remove ridges with scraper.
 5. Total Application Rate for Two Coats: Apply at an undiluted rate of 25 gallons minimum per 1,000 square feet. Increase application rate due to surface porosity per manufacturer's printed recommendations.
- D. Protect from traffic for three (3) days minimum after application.

3.06 TYPE E ASPHALT - PAVING REPLACEMENT

- A. Establish subgrade elevations allowing for new asphalt layers.
- B. Rip established subgrade surface to depth to 10 - 12" and bring to optimum moisture content and compact to 95% minimum.
- C. Prepare and sterilize new surface per CALTRANS Standards.
- D. Place two lifts of hot asphalt for a finished thickness of 3" at hardcourt and 3.5" at fire lane. Top lift to be 3/8" fine asphalt paving 1-1/2" thick, lower lift 1/2" maximum, medium asphalt paving 2-1/2" thick. Place, compact, and test per current Caltrans Standards.
- E. Apply (2) application of seal coat over all paving.

3.07 FIELD QUALITY CONTROL

- A. On-Site Work:
 1. Water Test: Flood test paving to show surfaces are free of standing puddles, and drain properly.
 2. Material Tests:
 - a. Made at District's option, by District selected Testing Lab.
 - b. District's Inspector to select test sample locations.
 - c. The Contractor is to repair test areas at no additional cost to District.
 - d. Testing costs by Contractor.

ASPHALTIC CONCRETE PAVING, PATCHING, AND REPLACEMENT

3.08 CLEANING

Remove equipment, excess materials, debris, and material splashes from abutting work.

3.09 REPAIR EXISTING CRACKS:

- A. Less than 1/4" up to 1/2": Repair with OverKote, Crack Filler by Diversified Asphalt Products or approved equal.
- B. Greater than 1/2" but less than 1": Remove asphalt a minimum of 2" down or to sound pavement and re-pack area with asphalt paving mix following procedures under paragraph 3.06.
- C. Greater than 1": Follow procedures under paragraph 3.06.

3.10 PATCHING EXISTING PAVEMENT

- A. Remove any defective pavement and existing deteriorated in areas defined and all pavement disturbed by construction activity to minimum 6" in depth or until sound subgrade is obtained. Extend limits minimum 1' into sound pavement; make cuts in straight lines.
- B. Contractor to remove spoils from site and dispose of properly.
- C. Apply tack coat to sides and bottom of excavated areas.
- D. Place asphaltic concrete in maximum 4" high lifts thoroughly and evenly compact using equipment which will obtain maximum compaction without damage to surrounding pavement.
- E. Contour and blend patches to lines and elevations of adjacent surfaces.
- F. Determine location of "bird baths". Apply tack coat and blend new leveling asphalt to existing surface.
- G. Repairing Existing Cracks:
 - 1. Less than 1/4" up to 1/2": Repair with OverKote, Crack Filler by Diversified Asphalt Products or approved equal.
 - 2. Greater than 1/2" but less than 1": Remove asphalt a minimum of 2" down or to sound pavement and re-pack area with asphalt paving mix following procedures under Paragraph 3.06.
 - 3. Greater than 1": Follow procedure under Paragraph 3.06.
- H. Apply 2 applications of seal coat 2 days apart over entire surface and re-stripe.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. All new and existing asphalt pavement areas as indicated in the Drawings is to be seal coated.
- B. All existing asphalt pavement areas to receive seal coat as indicated in the Drawings is to have all cracks filled prior to seal coats.

1.02 RELATED SECTION

- A. Section 32 12 16.08 - Asphaltic Concrete Paving, Patching and Replacement.
- B. Section 32 17 23.13 - Pavement Marking.

1.03 QUALITY ASSURANCE

- A. Qualification of workmen:
 - 1. Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the design and application of work described for this section, and who shall be present at all times during progress of the work of this section and shall direct all work performed under this section.
 - 2. For actual seal coating and operation of the required equipment, use only personnel who are thoroughly trained and experienced in the skills required.

PART 2 - PRODUCTS

2.01 SEAL COAT

- A. The surface Seal Coat of existing and new Asphalt Pavement shall meet Green Book, Specification No. 203-9 Seal Coat Asphalt Based.
- B. Over Kote Asphalt Pavement Coating, Over Kote 1 Crack Filler and Over Kote Crack Filler 2 by Reed & Graham, Inc. or approved equal.

2.02 CRACK FILLER

- A. Over Kote Asphalt Pavement Coating, Over Kote Crack Filler and Over Kote Crack Filler II by Reed & Graham, Inc. or approved equal.

2.03 OTHER MATERIALS

All other materials, not specifically described but required for proper and complete installation of pavement seal coat, shall be provided to complete the work of this section.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Inspection: Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 1. Verify that seal coat may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
- B. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Architect.
 - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- C. New and existing Asphalt Paving:
 - 1. The surface shall be cleaned of all dirt, debris oil, or foreign matter. After thoroughly cleaning, dampen the surface with water. Remove any excess water prior to application of sealer. Rough or irregular areas are to be treated with a mastic mix consisting of two pounds of 30 mesh silica sand per gallon of seal coat, prior to the applications of seal coats.
- D. Repairing Existing Cracks:
 - 1. Less than 1/4" fill with Over Kote 1, Crack Filler by Reed & Graham, Inc. or approved equal.
 - 2. Greater than 1/4" but less than 1/2" fill with Over Kote, Crack Filler 2 by Reed & Graham, Inc. or approved equal.
 - 3. Greater than 1/2" but less than 1". Remove asphalt a minimum of 2" down or to sound pavement and re-pack area with asphalt paving mix following procedures under Section 32 12 16.08, Paragraph 3.06.
 - 4. Greater than 1". Follow procedure under Section 32 12 16.08, Paragraph 3.06.
- E. New Asphalt Paving is not to be seal coated for a minimum of 36 days after installation of asphalt, to allow new paving to cure and prevent slurry seal blistering.

3.02 APPLICATION

- A. Seal coat shall be a two-coat application, each at the rate of approximately 25 gallons per 1000 square feet of pavement for application of each coat at 3 mils minimum thickness. Application may be made with squeegees, brooms, or mechanical applicators designed for applying slurry seal. Application is to be made by experienced technicians. Finished surface shall be smooth, without ridges, loops, and holidays.
- B. Apply per manufacturer recommended procedure.

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ASPHALT PAVEMENT SEAL COAT AND CRACK FILLER

- C. Do not place seal coat when the atmospheric temperature is below 65°F, or during unsuitable weather.
- D. Provide **two (2)** applications of seal coats on both new and existing asphalt surface as indicated on the Drawings. Coats shall be a minimum two (2) days apart.
- E. At new asphalt paving the Contractor shall be required to stripe parking lot areas where parking lot work is indicated, immediately after placement of asphalt. Contractor shall re-stripe a second time, 45 days later after application of seal coats.

3.03 CLEANING AND PROTECTION

- A. After completion of operations, clean surfaces of excess or spilled slurry material.
- B. Do not allow any foot or vehicular traffic on paving for 24 hours minimum, or until paving slurry has dried.
- C. Provide proper barricades and warning devices for slurry seal protection until it is opened to traffic.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes exterior Portland cement concrete paving for the following:
 - 1. Sidewalk.
 - 2. HVAC enclosure paving.
- B. Portland cement concrete paving shall be stable, firm and slip-resistant and shall comply with CBC Sections 11B-302 and 11B-403.
- C. Related Sections:
 - 1. Section 31 00 00 - Earthwork.

1.02 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.03 PROJECT CONDITIONS

Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 FORMS

- A. Form Materials: Plywood, metal, metal framed plywood, or other acceptable panel type materials to provide full depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a 100 foot or less radius.
- B. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOC) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150/C150M-09, Type I.
 - 1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.
- B. Fly Ash: ASTM C 618, Type F.

- C. Normal Weight Aggregates: ASTM C33/C33M-08, Class 4, and as follows. Provide aggregates from a single source.
 - 1. Maximum Aggregate Size: 3/4 inches.
 - 2. Do not use fine or coarse aggregates that contain substances that cause spalling.
 - 3. Local aggregate not complying with ASTM C33/C33M-08 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
- D. Water: Potable.

2.03 ADMIXTURES

- A. Provide concrete admixtures that contain not more than 0.1 percent chloride ions and are certified to be compatible with each other.
- B. Air-Entraining Admixture: ASTM C260-06.
- C. Water-Reducing Admixture: ASTM C494/C494M-10a, Type A or High-Range. Water-Reducing Admixture: ASTM C494/C494M-10a, Type F or Type G.

2.04 CURING MATERIALS

- A. Clear Waterborne Membrane-Forming Curing Comb: ASTM C309-07, Type I, Class B.
 - 1. Provide material that has a maximum VOC rating meeting California Air Resource Board requirements.

2.05 CONCRETE MIX

- A. Prepare design mixes for each type and strength.
- B. Proportion mixes conforming to CALTRANS Class B minimum to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28-Day): 2000 psi.
 - 2. Maximum Water-Cement Ratio at Point of Placement: 0.45.
 - 3. Slump Limit at Point of Placement: 3 inches.
 - a. Slump limit for concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-inch slump concrete.
- C. Add concrete accelerator to speed up curing time as needed to meet schedule.
- D. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows with a tolerance of plus or minus 1-1/2 percent:

- E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.06 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C94/C94M-10a.
- B. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 SUBSURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Base:
 - 1. Provide 2" sand or decomposed granite aggregate base under all concrete.

3.02 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.03 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
- B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as shown on Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows:
 - 1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
 - 2. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.
- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
 - 1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- D. Isolation Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 20 feet, unless indicated otherwise.
 - 2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated.

3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- E. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.

3.05 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
1. When concrete placing is interrupted for more than 1/2 hour, place a construction joint.
- F. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.

2. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

3.06 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
 1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
- B. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
 1. Radius: 3/8 inch.

3.07 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.

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- E. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- F. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.08 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.
- B. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Includes: Exterior warning surfaces at traffic walks; also denoted on drawings as truncated dome pavers, tiles or other industry standard nomenclature.
 - 1. Concrete recessed tile.
 - 2. Reinforced composite surface-mounted tile.
- B. Related Work:
 - 1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
 - 2. Portland Cement Concrete Paving: Section 32 13 13.

1.02 SUBSTITUTIONS

Only written approval of the Architect, by Addenda or Change Order, will permit substitutions for materials specified; in accordance with Article, Title 24, Part 2, CBSC, Section 01 25 13 Product Options and Substitutions.

1.03 QUALITY ASSURANCE

- A. Standards: In general, Work shall conform to latest edition of the following standards as applicable, and as modified herein.
 - 1. Installation: Tile Council of America, Handbook for Ceramic Tile Installation.
- B. Product shall comply with current California Building Standards Commission, Title 24, Part 12 CBSC, Chapters 12-11A and 12-11B, "Building and Facility Access Specifications".
- C. Warranty: Five (5) year warranty from the manufacturer stating that detectable warning products and directional surfaces shall ensure consistency and uniformity of the following:
 - 1. Shape
 - 2. Color Fastness
 - 3. Conformation
 - 4. Sound-on-cane acoustic equality
 - 5. Resilience
 - 6. Attachment will not degrade significantly for at least 5 years. Significant degradation shall mean that the product maintains at least 90% of its approved design characteristics.
- D. Detectable warning surfaces shall comply with CBC Section 11B-705.1.
- E. Detectable warning surfaces at transit boarding platform edges, bus stop, hazardous vehicular areas, reflecting pools and track crossings shall be yellow and approximate FS 33538 of Federal Standard 595C. Detectable surfaces at other locations shall be either the aforementioned yellow or a color providing a 70 percent minimum visual contrast with that of adjacent walking surfaces.

DETECTABLE/TACTILE WARNING SURFACES

The material used to provide visual contrast shall be an integral part of the surface. CBC Section 11B-705.1.1.3.

- F. Detectable warning surfaces shall differ from adjoining surfaces in saliency or sound-on-cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands or cut-through medians. CBC Section 11B-705.1.1.4.

1.04 SUBMITTALS

- A. Samples in duplicate: Manufacturer's standard color range.
- B. Warranties: Manufacturer's standard warranty (5 year warranty). See requirements under 1.03, Quality Assurance of this Section.
- C. Manufacturers: Recommended installation instructions.
- D. Shop Drawings: Showing plans of tile placement including joints for each installation location, type used.
- E. Material: Test reports.
- F. Maintenance Instructions.

1.05 DELIVERY, STORAGE AND HANDLING

Deliver tile to Site in sealed containers with grade seals intact. Store materials in a dry location.

1.06 PROJECT CONDITIONS

- A. Coordinate this work with work and backing furnished under other Specifications Sections.
- B. Placement of tactile surfaces shall coincide with concrete curb ramps and concrete paving leading to a vehicular traffic lane pedestrian crossing.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Recessed Concrete Tile: Conform to Americans with Disabilities Act and CBC Section 11B-705 (Part 2, Title 24), latest edition. Tile to be standard grade; manufactured by Wausau Tile, Inc., Wausau, WI; 800-388-8728, or approved equivalent.
 - 1. Other Acceptable Manufacturers:
 - a. ADA Solutions Inc.; 800-372-0519.

B. Materials:

1. Concrete Tile Size:
 - a. Nominal: 12" square.
 - b. Actual: 11-13/16"
2. Thickness: 2-3/4"
3. Weight: 24 to 32-1/2 lbs./sq. ft.
4. Dimensional Tolerance: +/- 1/16" (length, width, height, convex, and concave).
5. Color: As selected by Architect from manufacturer's full range of colors and patterns.
6. Pattern: ADA-2 Truncated Dome, 5 domes each side of tile.
 - a. Spacing: 2.3" to 2.4" nominal center of domes in both directions.
 - b. Dome diameter to be 0.9" to 0.92" at base and 0.45" to 0.47" at top of dome.
 - c. Height of dome: 0.18" to 0.22"
7. Minimum physical properties of the detectable/tactile surfaces:
 - a. Compressive Strength - ASTM C140/C140M-13 equal to or greater than 8,000 psi.
 - b. Flexural Strength - ASTM C293/C293M-10 equal to or greater than 800 psi average.
 - c. Water Absorption - ASTM C140/C140M-13a less than 6%.
 - d. Freeze/Thaw: ASTM C67-13 equal or less than 1% loss of dry weight (50 cycles)
 - e. Center Load: WTCL99 = 1,850 pounds
 - f. Warranty: See 1.03 B and C of this section.

C. Setting Bed (for thick mortar method):

1. 8" to 12" compacted road grade gravel (#6), sub-base.
2. 6" to 8" concrete base.
3. 1-1/4" thick latex mortar bed with 2" x 2" - 16/16 welded galvanized wire mesh reinforcing per manufacturer's requirements.
4. Portland cement mortar mix: ASTM C150/C150M-12, Laticrete 226, thick bed mortar with #3701 Admix, or manufacturer approved equivalent.
5. Slurry Bond Coats: Laticrete International 4237 bond coat or approved equivalent per manufacturer's approved recommendations. Provide slurry bond coat beneath and above mortar bed. A 100% bond between tile and setting bed is required. To achieve this, the "back butter" method and a 3/8" x 1/2" notched trowel shall be used per manufacturer's instructions.
6. Grout: All joints shall be grouted using a latex or acrylic admixture for waterproofing. The use recommendations of the admixture manufacturer must be followed.
7. Cementitious Materials:
 - a. Portland cement conforming to ASTM C150/C150M-12 for Portland cement.
 - b. Aggregates conforming to ASTM C33/C33M-13 for normal weight concrete aggregate.

2.02 MATERIALS

- A. Surface-Mounted Tile: Conform to Americans with Disabilities Act and CBC Section 11B-705 (Part 2, Title 24), latest edition. Tile to be standard grade; manufactured by ADA Solutions Inc., 800-372-0519, or approved equivalent.
 - 1. Other Acceptable Manufacturers:
 - a. ARMOR-TILE; 800-682-2525.
- B. Materials:
 - 1. Tile Size:
 - a. 24" x 36", 24" x 48", 24" x 60", 36" x 48" and 36" x 60"
 - b. Combination as required by the Drawings.
 - c. Beveled edges.
 - 2. Thickness: 3/16"
 - 3. Material: Exterior grade homogenous glass, carbon, and reinforced composite material with colorfast UV stabilizer.
 - 4. Dimensional Tolerance: +/- 1/16" (length, width, height, convex, and concave).
 - 5. Color: Yellow unless noted otherwise on Drawings.
 - 6. Pattern: ADA-2 Truncated Dome, 5 domes each side of tile.
 - a. Spacing: 2.3" to 2.4" nominal center of domes in both directions.
 - b. Dome diameter to be 0.9" to 0.92" at base and 0.45" to 0.47" at top of dome.
 - c. Height of dome: 0.18" to 0.22"
 - 7. Minimum physical properties of the detectable/tactile surfaces:
 - a. Compressive Strength - ASTM D 695 equal to or greater than 28,900 psi.
 - b. Flexural Strength - ASTM 790 D 790 equal to or greater than 29,300 psi.
 - c. Water Absorption - ASTM D 570 less than .07%.
 - d. Freeze/Thaw: ASTM C 1026, no disintegration
 - e. Load Bearing @ 16,000 lbs.: AASHTO-H20, no damage
 - f. Slip Resistant: ASTM C 1028 1.18 dry, 1.05 wet
 - g. Warranty: See 1.03 B and C of this section.

C. Installation:

1. Installation per manufacturer's recommendation.
2. Tiles to be installed with adhesive, stainless steel fasteners and edge sealed.
3. Fasteners: 1/4" x 1 5/8" composite sleeve anchor with stainless-steel pins.
4. Adhesive: One component structural elastic adhesive.
5. Sealant: BASF NP1, Silkaflex.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine newly poured concrete surfaces scheduled to receive tactile tile work. Report any unsatisfactory conditions.
- B. Do not start work until unsatisfactory conditions are corrected. Starting work constitutes acceptance of surfaces. Refer to manufacturer's recommendations.

3.02 INSTALLATION - GENERAL

- A. Tile Placement: By skilled mechanics and in accordance with the applicable provisions of the manufacturer's installation recommendations for cast-in-place or surface-mounted tiles.
- B. Install Portland Cement paving in accordance with Section 32 13 13, Portland Cement Concrete Paving.
- C. Place tiles and set per manufacturer's recommendations in a single plane, 1:12 maximum slope, flush with surrounding paved surfaces. The tile shall have a 2' minimum dimension in the direction of travel perpendicular to the traffic lane being crossed. Arrange tile pattern to allow in-line approach by wheelchairs.
- D. Tiles shall be placed after poured concrete ramp/walk mix is placed and screeded to the desired slope.
- E. Work tiles into concrete mix to the desired level flush with adjacent surfaces before finishing adjacent surfaces. Place 2 each 25 lb weights on each tile to ensure solid contact with concrete on the underside of the tile.

3.03 CLEANING

- A. Protection: Protect finish and surface of tile and adjacent materials with Vaseline to prevent staining.
- B. Cleaning: Upon completion of any portion of tile work, remove rubbish and unused materials incidental to the installation, and give the finished surfaces a thorough cleaning in a manufacturer-approved manner. Remove traces of cement and dust accumulations. Do not use acid solutions on tactile tile work.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Traffic lines and markings.
 - 2. Paint.
 - 3. Glass beads.
- B. Related Sections:
 - 1. Section 32 12 16 - Asphalt Paving.
 - 2. Section 32 13 14 - Portland Cement Concrete Paving
- C. Provisions of Division 1 to apply to this section.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.
- B. ASTM International:
 - 1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
 - 2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
 - 3. ASTM D562 - Standard Test Method for Consistency of Paints Using the Stormer Viscometer.
 - 4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
 - 5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
 - 6. ASTM D969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
 - 7. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
 - 8. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
 - 9. ASTM D1475 - Standard test Method for Density of Liquid Coatings, Inks, and Related Products.
 - 10. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
 - 11. ASTM D2202 - Standard Test Method for Slump of Sealants.
 - 12. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
 - 13. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.

14. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

- C. California Manual on Uniform Traffic Control Devices (CMUTCD).
- D. Standard Specifications for Public Works Construction (SSPWC).
- E. California Building Code, CBC 2019 11B.

1.3 PERFORMANCE REQUIREMENTS

- A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.
- B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.4 SUBMITTALS

- A. Product Data: Submit paint formulation for each type of paint.
- B. Samples:
 - 1. Submit eight (8) sample plates of each color of material. Prepare four (4) plates without glass beads and four (4) with glass beads for each different batch of material. After approval, Owner will retain these plates for field comparisons of applied paint.
 - 2. Submit two gallons and four one quart paint samples accompanied by properly executed test reports.
 - 3. Submit samples of glass bead in compliance with AASHTO M247.
- C. Test Reports: Submit source and acceptance test results in accordance with AASHTO M247.
- D. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Sustainable Design Requirements:
 - 1. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.
- B. Perform Work in accordance with SSPWC, CBC 2019 11B and the MUTCD.
- C. Maintain one (1) copy each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified

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in this section with minimum three (3) years documented experience.

- B. Applicator: Company specializing in performing work of this section with minimum three (3) years documented experience and approved by Architect/Engineer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.
- B. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
- C. Do not apply paint when temperatures are expected to fall below 50 degrees F for 24 hours after application.
- D. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.9 WARRANTY

- A. Furnish three (3) year manufacturer's warranty for traffic paints.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of traffic paints for three years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 PAINTED PARKING LOT/TRAFFIC PAVEMENT MARKINGS

- A. Manufacturers:
 - 1. Pervo Paint Company.
 - 2. Pathmark Traffic Products.
 - 3. Safety Coatings Inc.
 - 4. Franklin Paint Company.
 - 5. EZ-Liner Industries Model.
 - 6. Substitutions: Permitted with prior approval of Architect/Engineer.
- B. Furnish materials in accordance with SSPWC and the CMUTCD.
- C. Paint: Ready mixed, conventional and fast dry waterborne traffic paints, lead-free, non-toxic, NASSHTO Test Deck, minimum retroreflectance of 100 mcads, durability rating of 6 or more after in place for 9 months; within

following limits:

1. Pigment, percent by weight: 60 plus or minus 2.
 2. Vehicle, percent by weight: 40 plus or minus 2.
 3. Non-Volatile, percent by weight of paint: 76.0.
 4. Weight per gallon, pounds minimum 13.0.
 5. Viscosity: 80-95 Krieb Units at 77 degrees F.
 6. Grind (Hegeman Gauge), minimum Field Tested no tracking time under ambient conditions: 20-90 seconds.
 7. Dry Through Time, 15 mils wet at 90 percent relative humidity, 72 degrees F, ASTM D1640: 125 minutes maximum.
 8. VOC (Volatile Organic Content): One lbs/gal maximum.
- D. Glass Beads: AASHTO M247, Type 1, coated to enhance embedment and adherence with paint.

2.2 EQUIPMENT

- A. Continuous Longitudinal Line Application Machine: Use application equipment with following capabilities.
1. Dual nozzle paint gun to simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
 2. Pressurized bead-gun to automatically dispense glass beads onto painted surface, at required application rate.
 3. Measuring device to automatically and continuously measure length of each line placed, to nearest foot.
 4. Device to heat paint to approved temperature for fast dry applications.
- B. Machine Calibration:
1. Paint Line Measuring Device: Calibrate automatic line length gauges to maintain tolerance of plus or minus 25 feet per mile.
 2. Cycle Length/Paint Line Length Timer: Calibrate cycle length to maintain tolerance of plus or minus 6 inches per 40 feet; calibrate paint line length to maintain tolerance to plus or minus 3 inches per 10 feet.
 3. Paint Guns: Calibrate to simultaneously apply paint binder at uniform rates as specified with an allowable tolerance of plus or minus 1 mil.
 4. Bead Guns: Calibrate to dispense glass beads simultaneously at specified rate. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time. Verify weight of glass beads.
- C. Other Equipment:
1. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind strippers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

2.3 SOURCE QUALITY CONTROL

- A. Test and analyze traffic paints in accordance with these specifications.
- B. Make paints and glass beads available for inspection at manufacturer's factory prior to packaging for shipment. Notify Architect/Engineer at least seven days before inspection is allowed.
- C. Allow witnessing of factory inspections and test at manufacturer's test facility. Notify Architect/Engineer at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not apply paint to concrete surfaces until concrete has cured for 28 days, unless otherwise approved by Architect/Engineer.

3.2 PREPARATION

- A. Maintenance and Protection of Traffic:
 - 1. Provide short term traffic control in accordance with Section 01 50 00 - Temporary Facilities and Controls.
 - 2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.
 - 3. Maintain travel lanes between 7: 00 AM to 9: 00 AM, and between 4: 00 PM and 6: 00 PM. Unless otherwise approved by Architect/Engineer.
 - 4. Maintain access to existing businesses and other properties requiring access.
- B. Surface Preparation.
 - 1. Clean and dry paved surface prior to painting.
 - 2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.
 - 3. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center.
 - 4. Notify Architect/Engineer after placing pavement spots and minimum three (3) days prior to applying traffic lines.

3.3 EXISTING WORK

- A. Remove existing markings in an acceptable manner. Do not remove existing pavement markings by painting over with blank paint. Remove by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.
- B. Clean and repair existing remaining or reinstalled lines and legends.

3.4 APPLICATION

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- A. Agitate paint for 1-15 minutes prior to application to ensure even distribution of paint pigment.
- B. Dispense paint at approved temperature to wet-film thickness of 15 mils, except dispense edge markings to wet-film thickness of 12 mils.
- C. Apply glass beads at rate of six (6) pounds per gallon of paint.
- D. Apply markings to indicated dimensions at indicated locations.
- E. Prevent splattering and over spray when applying markings.
- F. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free. When vehicle crosses a marking and tracks it or when splattering or over spray occurs, eradicate affected marking and resultant tracking and apply new markings.
- G. Collect and legally dispose of residues from painting operations.
- H. Install Work in accordance with SSPWC and CMUTCD.

3.5 APPLICATION TOLERANCES

- A. Maximum Variation from Wet Film Thickness: 1 mil.
- B. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.
- C. Maintain cycle length for skip lines at tolerance of plus or minus six (6) inches per 40 feet and line length of plus or minus three (3) inches per 10 feet unless otherwise approved by Architect/Engineer.
- D. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F

3.6 FIELD QUALITY CONTROL

- A. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.
- B. Repair lines and markings, which after application and curing do not meet following criteria:
 - 1. Incorrect Location: Remove and replace incorrectly placed patterns.
 - 2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
 - 3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new

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markings on cleaned surface in accordance with this Section.

- C. Replace defective pavement markings as specified throughout a three (3) year warranted period. Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner's painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work. If this requirement is different in the Contract Documents, then the Contract Documents override this specification.
- D. A three member team will evaluate warranty provisions. Team will consist of one member from Owner, one member from Contractor, and third person who is mutually acceptable to Owner and Contractor. Any costs for third person will be equally shared between Owner and Contractor. At least once each year, beginning with year after acceptance, team shall:
 - 1. Observe Owner taking readings by retroreflectometer, or review Owner records of such evaluation. The number of readings will be as large as necessary to ensure that minimum criteria are satisfied. Readings will be during period from March 15 through October, when pavement is clean and dry.
 - 2. Determine color fade, discoloration or pigment loss based on visual color comparison between original sample plates with glass beads and in-place pavement markings.
 - 3. Determine magnitude of material loss.
- E. Prepare list of defective areas and areas requiring additional inspection and evaluation to decide where material may need replaced. Provide traffic control as necessary if markings require more detailed evaluation.
- F. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists during warranty period:
 - 1. Average retro-reflectivity within any 528 foot section is less than 1225 mcd/m²/1x for white pavement markings and 100 mcd/m²/1x for yellow pavement markings.
 - 2. Marking is discolored or exhibits pigment loss, and is determined to be unacceptable by three member team based on visual comparison with beaded color plates.
 - 3. More than 15 percent of area of continuous line, or more than 15 percent of combined area of skip lines, within any 528 foot section of roadway is missing.
- G. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original three (3) year period even when replacement materials have been installed as specified.
- H. When eradication of existing paint lines is necessary, eradicate by shot

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blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to requirements in Section 32 13 13 or Section 32 12 16.

- I. Maintain daily log showing work completed, results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.7 PROTECTION OF FINISHED WORK

- A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

3.8 SCHEDULES

- A. Pavement Markings: Use the following schedule unless otherwise specified in construction drawings.

Items	Location
4 inch White Conventional	Edge
4 inch White Fast Dry	Edge
24 inch White Fast Dry	Stop Line
4 inch Yellow Conventional	Center
4 inch Yellow Fast Dry	Center

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Decorative Metal Picket Fencing and Accessories to match existing.
- B. Decorative Metal Picket Gates and Accessories to match existing.
- C.

1.2 RELATED SECTIONS

- A. Section 03 30 00 – Cast-In-Place Concrete.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in Current Code, CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
 - 1. ASTM A653/A653M –Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM B117 – Standard Practice for Operating Salt Spray (fog) Testing Apparatus.
 - 3. ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Layout of fences and gates with dimensions, details and finishes of components, accessories and post foundations.
- C. Product Data: Manufacturer's catalog cuts indicating material compliance and specified options.
- D. Samples: Color selections for finishes. If requested, samples of materials (e.g., caps and accessories).

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Sufficient experience manufacturing similar products.
- B. Erector's Qualifications: Sufficient experience installing similar products.

1.6 PROTECTION

- A. Damage to Adjoining Property and Existing Surfaces: Contractor shall assume all responsibility for damage to building surfaces and materials and shall restore them to their original condition should damage occur.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials so as to avoid damage under provisions of Division 01.

PART 2 PRODUCTS

2.1 ORNAMENTAL PICKET FENCE AND MAN-GATES

2.1a. Manufacture:

- A. Ameristar Fence, 888-333-3422. Product: Montage II, Style: 2 rail, Ornamental Picket Fence.
- B. Substitutions: Under provisions of Division 01.

2.1b. Requirements:

- C. Materials for fence framework (i.e., pickets, rails and posts) shall be manufactured from coil steel having a minimum yield strength of 50,000 psi. All steel shall be galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 ounces per square foot (coating designation G-90), hot dip process.
- D. Pickets: Material for fence pickets shall be 1 inch square x 14 gauge minimum tubing at 4.98 inches on center.
- E. Rails: The cross-sectional shape of the rails shall conform to the manufacturer's standard design, with outside cross section dimensions of 1.75 inches minimum square x 14 gauge minimum. Picket holes in rail shall be spaced 4.98 inches on center.
- F. Posts: Posts at fence shall be square tube (Refer to Drawings) x 11 gauge minimum. Posts over 4" square are to be filled with concrete 3,000 psi grout entire length.

- G. Preassemble panels with rods or rivets supplied by manufacturer.
 - 1. Panel Width: Standard Panel width shall be 8' wide.
 - 2. Panel Height: Panel height shall be (6') as specified on Drawings
- H. Security Mesh (where specified): Galvanized 18 gauge, 3/16" round on 1/4" stagger perforated metal with continuous galvanized metal c-channel edge protector molding.
- I. Finish: Galvanized framework shall be subject to six stage pretreatment/wash (with zinc phosphate) followed by an electrostatic spray application of a two coat powder system. The base coat shall be a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils to 4 mils. Top coat shall be a TGIC polyester powder coat finish with a minimum thickness of 2 mils to 4 mils. The color shall be black. Coated galvanized framework shall have a salt spray resistance of 3500 hours using ASTM B117 without loss of adhesion. Paint system used shall not contain lead.

2.1c. Accessories:

- J. Rail Attachment Brackets: Pressed steel or cast malleable iron.
- K. Ornamental Picket Fence Accessories: Provide indicated items required to complete fence system. Galvanize each ferrous metal item in accordance with ASTM B695 and finished to match framing.
- L. Post Caps: Formed steel, cast or malleable iron or aluminum alloy, weathertight closure cap. Provide one standard post cap for each post.
- M. Picket Tops: Provide standard steel top.
- N. Panel Hangers: Shall be stainless steel or galvanized steel with galvanized, stainless, or zinc plated fasteners. All brackets shall be finished to match fence finish and color.
- O. Keeper: Provide automatically engaging keeper for each gate leaf, holding it in the open position until manually released.
- P. Double Leaf Gates: Provide gate stops for all double gates, consisting of mushroom type or flush plate with anchors. Set in concrete to engage the center drop rod or plunger.

2.1d. Setting Bed:

Q. Concrete: Minimum 28 day compressive strength of 3,000 pounds per square inch for setting fence posts. Refer to Section 03 30 00.

2.2 ORNAMENTAL STEEL FENCE AND GATE SYSTEM

2.2a. Manufacture:

- A. Ameristar Fence, 888-333-3422.
- B. Beta Fence, A Praesidiad Company.
- C. Substitutions: Under provisions of Division 01.

2.2b. Requirements: Match existing with the following minimum requirements:

- A. Materials for fence framework (i.e., pickets, rails and posts) shall be manufactured from coil steel having a minimum yield strength of 50,000 psi. All steel shall be galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 ounces per square foot (coating designation G-90), hot dip process.
- B. Pickets: Material for fence pickets shall be $\frac{3}{4}$ " inch square x 14 gauge minimum tubing at 4.98 inches on center.
- C. Rails: The cross-sectional shape of the rails shall conform to the manufacturer's standard design, with outside cross section dimensions of 2" inches minimum square x 12 gauge minimum. Picket holes in rail shall be spaced 4.98 inches on center.
- D. Posts: Posts at fence shall be square tube (Refer to Drawings) x 11 gauge minimum. Posts over 4" square are to be filled with concrete 3,000 psi grout entire length.

Preassemble panels with rods or rivets supplied by manufacturer.

- 1. Panel Width: Standard Panel width shall be 8' wide.
- 2. Panel Height: Panel height shall be (4', 5', 6', 7', or 8') as specified on Drawings
- E. Security Mesh (where specified): Galvanized 18 gauge, 3/16" round on $\frac{1}{4}$ " stagger perforated metal with continuous galvanized metal c-channel edge protector molding.
- F. Finish: Galvanized framework shall be subject to six stage pretreatment/wash (with zinc phosphate) followed by an electrostatic spray application of a two coat powder system. The base coat shall

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be a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils to 4 mils. Top coat shall be a TGIC polyester powder coat finish with a minimum thickness of 2 mils to 4 mils. The color shall be black. Coated galvanized framework shall have a salt spray resistance of 3500 hours using ASTM B117 without loss of adhesion. Paint system used shall not contain lead.

2.2c. Accessories:

- G. Rail Attachment Brackets: Pressed steel or cast malleable iron.
- H. Ornamental Rolling Fence Accessories: Provide indicated items required to complete fence system. Galvanize each ferrous metal item in accordance with ASTM B695 and finished to match framing.
- I. Post Caps: Formed steel, cast or malleable iron or aluminum alloy, weathertight closure cap. Provide one standard post cap for each post.
- J. Picket Tops: Provide standard steel top.
- K. Panel Hangers: Shall be stainless steel or galvanized steel with galvanized, stainless, or zinc plated fasteners. All brackets shall be finished to match fence finish and color.
- L. Keeper: Provide automatically engaging keeper for each gate leaf, holding it in the open position until manually released.

2.2d. Setting Bed:

- M. Concrete: Minimum 28 day compressive strength of 3,000 pounds per square inch for setting fence posts. Refer to Section 03 30 00.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify areas to receive fencing are completed to final grades and elevations.
- B. Ensure property lines and legal boundaries of work are clearly established.

3.2 INSTALLATION

- A. Shop apply in local Shop an accent paint color (Blue) prior to installation, refer to Section 09 90 00- Paint.
- B. Install fence in accordance with manufacturer's instructions.
- C. Space posts uniformly at 8 feet on center maximum, unless otherwise noted.
- D. Concrete Footings: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter four times greater than outside dimension of posts and depths approximately 6 inches deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils and for posts with heavy lateral loads. Set post bottom below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post and slope to direct water away from posts. Refer to Drawings for footing size.
- E. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.
- F. Align fence panel posts. Panels shall be attached to posts using mechanically fastened panel brackets supplied by the manufacturer.
- G. Touch-up local Shop applied accent paint color (Blue) after installation is completed.

3.3 GATE INSTALLATION

- A. Gate: Install gate plumb, level and secure for a full opening without interference. Install and adjust operator for smooth operation and lubricate where necessary. Gate shall operate freely and without bind.
 - 1. Adjust fencing prior to anchoring to insure matching alignment at abutting joints.
 - 2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of fencing assemblies. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Install in concrete foundations as indicated.
 - 3. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up galvanizing and shop prime coats.
 - 4. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding appearance and quality of welds made. Repair paint finish.

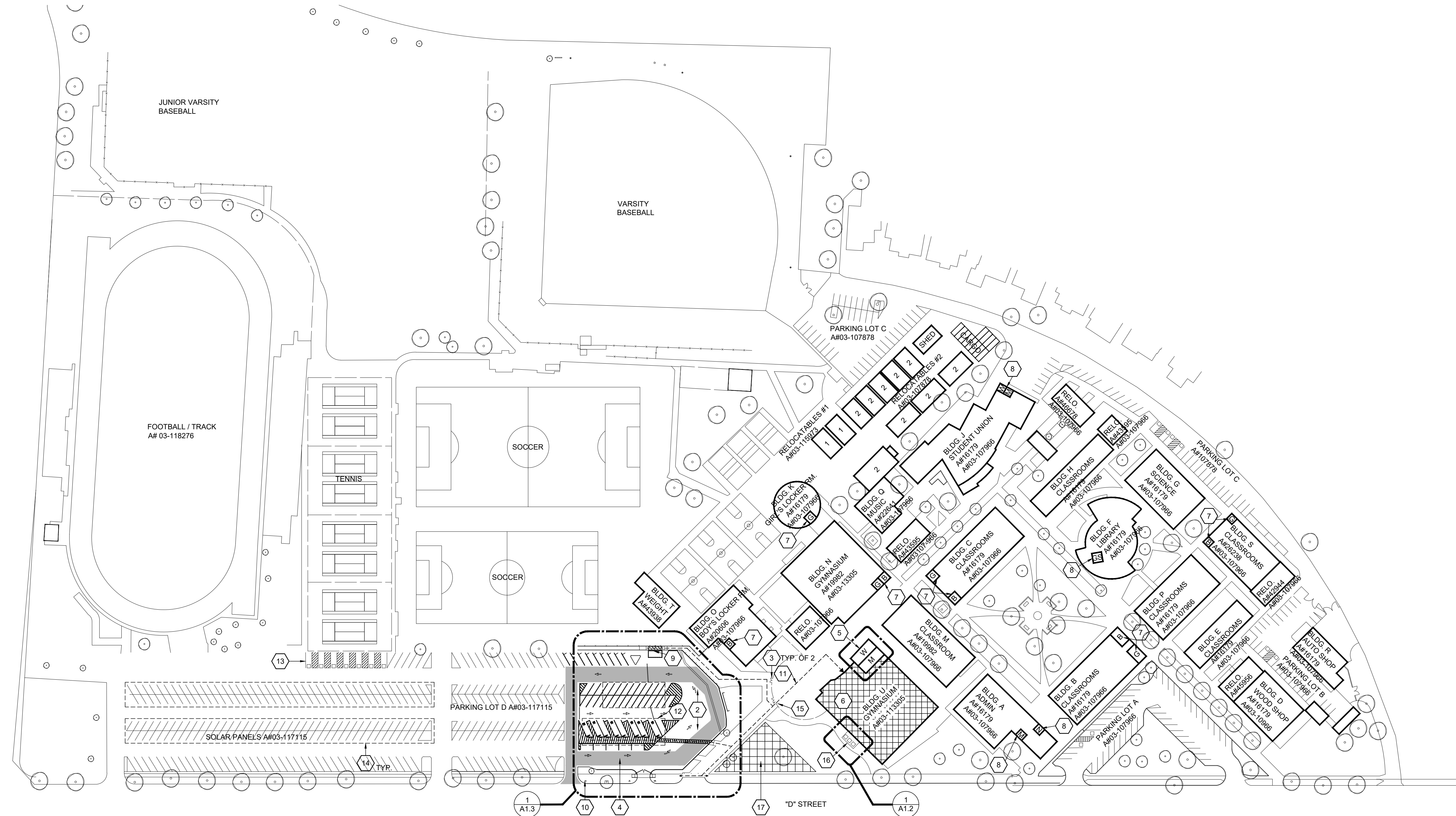
3.4 ACCESSORIES

- A. Install post caps and other accessories to complete fence.

3.5 CLEANING

- A. Cleaning and Finishing: Upon completion of the work, clean all exposed surfaces, removing any discoloration or foreign matter.
- B. Touch up all abraded or scraped areas with touch-up paint to match fence color. Touch-up shall not be obvious.
- C. Protect all installed work against damage from other construction work.
- D. Clean Up: Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from the fence installation area.

END OF SECTION




1 OVERALL SITE PLAN
SCALE: 1" = 80'
TRUE NORTH

GENERAL NOTES	KEYNOTES	PARKING LOT ANALYSIS	LEGEND	DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE STATEMENT:
<p>A. FOR TYP. SYMBOLS AND ABBREVIATIONS, SEE SHEET G1.0.</p> <p>B. PROVIDE TEMPORARY 6' HIGH CHAIN LINK FENCE ENCLOSURES WITH SCREENING FABRIC AND LOCKABLE GATES AS REQUIRED FOR CONSTRUCTION ACCESS AT CONTRACTOR'S STAGING AREA AND AROUND ALL CONSTRUCTION SITES.</p> <p>C. WHERE (E) LAWNS ARE DAMAGED BY THE EXECUTION OF THIS CONTRACT, FILL, COMPACT, AND REPLANT.</p> <p>D. CONTRACTOR SHALL MAINTAIN EXISTING PLANTING WITHIN THE JOB SITE FENCE ENCLOSURE DURING DEMOLITION AND CONSTRUCTION PHASES. EXISTING IRRIGATION SYSTEMS SHALL EITHER REMAIN OPERATIONAL FOR CONTRACTOR'S USE OR CONTRACTOR SHALL HAND WATER EXISTING PLANT MATERIALS AS REQUIRED.</p> <p>E. REPAIR EXISTING IRRIGATION SYSTEMS DAMAGED DURING THE EXECUTION OF THIS CONTRACT. REPLACE PLANT MATERIALS DAMAGED DURING THE CONSTRUCTION PERIOD WITH THE SAME SPECIES OF EQUAL OR GREATER SIZE.</p> <p>F. A MINIMUM OF 15% OF ALL SCOPE WORK MUST BE PERFORMED IN-HOUSE BY GENERAL CONTRACTOR</p> <p>G. ALL WORK SHALL CONFORM TO 2019 TITLE 24, CALIFORNIA CODE OF REGULATIONS (CCR).</p> <p>H. A DSA ACCEPTED TESTING LABORATORY DIRECTLY EMPLOYED BY THE DISTRICT (OWNER) SHALL CONDUCT ALL THE REQUIRED TESTS AND INSPECTIONS FOR THE PROJECT.</p> <p>I. GRADING PLANS, DRAINAGE IMPROVEMENTS, ROAD AND ACCESS REQUIREMENTS AND ENVIRONMENTAL HEALTH CONSIDERATIONS SHALL COMPLY WITH ALL LOCAL ORDINANCE.</p>	<p>1. EXISTING CONCRETE SIDEWALK/ PAVING, PROTECT</p> <p>2. EXISTING ASPHALT SIDEWALK/ PAVING, PROTECT, RE: 1/A1.3</p> <p>3. EXISTING DECORATIVE METAL PAIR OF GATES, PROTECT</p> <p>4. EXISTING FIRE LANE, PROTECT, PAINT CURB RED THE ENTIRE LENGTH, RE: 1/A1.3</p> <p>5. EXISTING ACCESSIBLE MEN/BOYS/WOMEN/GIRLS TOILET TO BE IMPROVED, (A# 04-113305) RE: A2.1</p> <p>6. EXISTING GYMNASIUM (A# 03-113305) TO RECEIVE NEW HVAC, RE: MECH. & 5/A1.2</p> <p>7. EXISTING ACCESSIBLE STUDENT TOILET (A# 04-1107966), NO WORK</p> <p>8. EXISTING ACCESSIBLE STAFF TOILET (A# 04-1107966), NO WORK</p> <p>9. EXISTING ACCESSIBLE LOADING ZONE, PROTECT (A# 03-107966), RE: 1/A1.3</p> <p>10. EXISTING ACCESSIBLE TOW-A-WAY SIGN (A# 03-107966), RE: 9/A1.4</p> <p>11. EXISTING ACCESSIBLE PATH OF TRAVEL (A# 04-113305 & A# 03-117155)</p> <p>12. EXISTING ACCESSIBLE PARKING STALLS TO BE IMPROVED (A# 03-117115), RE: 1/ A1.3</p> <p>13. EXISTING ACCESSIBLE PARKING STALLS TO REMAIN, (A# 03-118276) PROTECT</p> <p>14. EXISTING SOLAR PANELS TO REMAIN (A# 03-117155), PROTECT</p> <p>15. NEW ACCESSIBLE 36" W. DECORATIVE METAL GATE, RE: 7/A1.4</p> <p>16. NEW MECHANICAL ENCLOSURE, RE: 1/A1.2</p> <p>17. EXISTING 28,000 S.F. SAFE DISPERSAL AREA</p>	<p>PARKING LOT A A#03-107966</p> <p>43 EXISTING STANDARD STALLS</p> <p>1 EXISTING ACCESSIBLE STALL</p> <p>1 EXISTING ACCESSIBLE VAN STALL</p> <p>PARKING LOT B A#03-107966</p> <p>28 EXISTING STANDARD STALLS</p> <p>1 EXISTING ACCESSIBLE STALLS</p> <p>1 EXISTING ACCESSIBLE VAN STALL</p> <p>PARKING LOT C A#03-107966</p> <p>70 EXISTING STANDARD STALLS</p> <p>2 EXISTING ACCESSIBLE STALL</p> <p>2 EXISTING ACCESSIBLE VAN STALL</p> <p>PARKING LOT D A#03-117155</p> <p>339 EXISTING STANDARD STALLS</p> <p>SOUTH: SCHOOL</p> <p>6 EXISTING ACCESSIBLE STALLS</p> <p>2 EXISTING ACCESSIBLE VAN STALLS</p> <p>NORTH: FOOTBALL STADIUM</p> <p>5 EXISTING ACCESSIBLE STALLS</p> <p>2 EXISTING ACCESSIBLE VAN STALLS</p>	<p>EXISTING BUILDING</p> <p>EXISTING GYM TO RECEIVE NEW HVAC</p> <p>ACCESSIBLE ENTRY</p> <p>EXISTING ACCESSIBLE PATH OF TRAVEL</p> <p>EXISTING FIRE LANE</p> <p>EXISTING SAFE DISPERSAL AREA</p> <p>EXISTING ACCESSIBLE TOILETS A#03-107966</p> <p>B=BOYS M=MENS</p> <p>G=GIRLS W=WOMENS GS=GENDER NEUTRAL STAFF</p>	<p>"THE P.O.T. IDENTIFIED IN THESE CONSTRUCTION DOCUMENTS IS COMPLIANT WITH THE CURRENT APPLICABLE CALIFORNIA BUILDING CODE ACCESSIBILITY PROVISIONS FOR PATH OF TRAVEL REQUIREMENTS FOR ALTERATIONS, ADDITIONS AND STRUCTURAL REPAIRS. AS PART OF THE DESIGN OF THIS PROJECT, THE P.O.T. WAS EXAMINED AND ANY ELEMENTS, COMPONENTS, OR PORTIONS OF THE P.O.T. THAT WERE DETERMINED TO BE NONCOMPLIANT 1) HAVE BEEN IDENTIFIED AND 2) THE CORRECTIVE WORK NECESSARY TO BRING THEM INTO COMPLIANCE HAS BEEN INCLUDED WITHIN THE SCOPE OF THIS PROJECT'S WORK THROUGH DETAILS, DRAWINGS AND SPECIFICATIONS INCORPORATED INTO THESE CONSTRUCTION DOCUMENTS. ANY NONCOMPLIANT ELEMENTS, FINDING OF UNREASONABLE HARDSHIP ARE SO INDICATED IN THESE CONSTRUCTION DOCUMENTS. DURING CONSTRUCTION, IF P.O.T. ITEMS WITHIN THE SCOPE OF THE PROJECT REPRESENTED AS CODE COMPLIANT ARE FOUND TO BE NONCONFORMING BEYOND REASONABLE CONSTRUCTION TOLERANCES, THEY SHALL BE BROUGHT INTO COMPLIANCE WITH THE CBC AS A PART OF THIS PROJECT BY MEANS OF A CONSTRUCTION CHANGE DOCUMENT."</p> <p>PATH OF TRAVEL TECHNICAL REQUIREMENTS FOR ACCESSIBLE ROUTE</p> <p>"ACCESSIBLE PATH OF TRAVEL AS INDICATED ON PLAN IS A BARRIER-FREE ACCESS ROUTE WITHOUT ABRUPT LEVEL CHANGES EXCEEDING 1/2" IF BEVELED AT 1:2 MAXIMUM SLOPE OR VERTICAL LEVEL CHANGES NOT EXCEEDING 1/4" MAXIMUM AND AT LEAST 48" IN WIDTH. SURFACE IS STABLE, FIRM, AND SLIP-RESISTANT. GROSS-SLOPE SHALL NOT BE STEEPER THAN 1:48 AND SLOPE IN THE DIRECTION OF THE TRAVEL SHALL NOT BE STEEPER THAN 1:20. ACCESSIBLE PATH OF TRAVEL SHALL BE MAINTAINED FREE OF OVERHANGING OBSTRUCTIONS TO 80" MINIMUM AND FREE OF OBJECTS PROTRUDING MORE THAN 4" FROM THE WALL, ABOVE 27" AND LESS THAN 80" ABOVE THE FLOOR. ARCHITECT SHALL VERIFY THAT THERE ARE NO BARRIERS IN THE PATH OF TRAVEL."</p>

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ARCHITECTS STAMP:




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CONSULTANTS STAMP:

SCHOOL DISTRICT:
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SCHOOL DISTRICT

PROJECT:
BONITA H.S.
GYMNASIUM HVAC
REPLACEMENT

JOB NUMBER: 12.01.04
DATE: 01/14/2022

REVISION:  DATE:
REVISION:  DATE:

DRAWING TITLE:
OVERALL
SITE PLAN

DRAWING NO.:

A1.1



4 CONCRETE PAVING DETAILS



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**BONITA UNIFIED
SCHOOL DISTRICT**

PROJECT:
BONITA HIGH
SCHOOL
GYMNASIUM HVAC

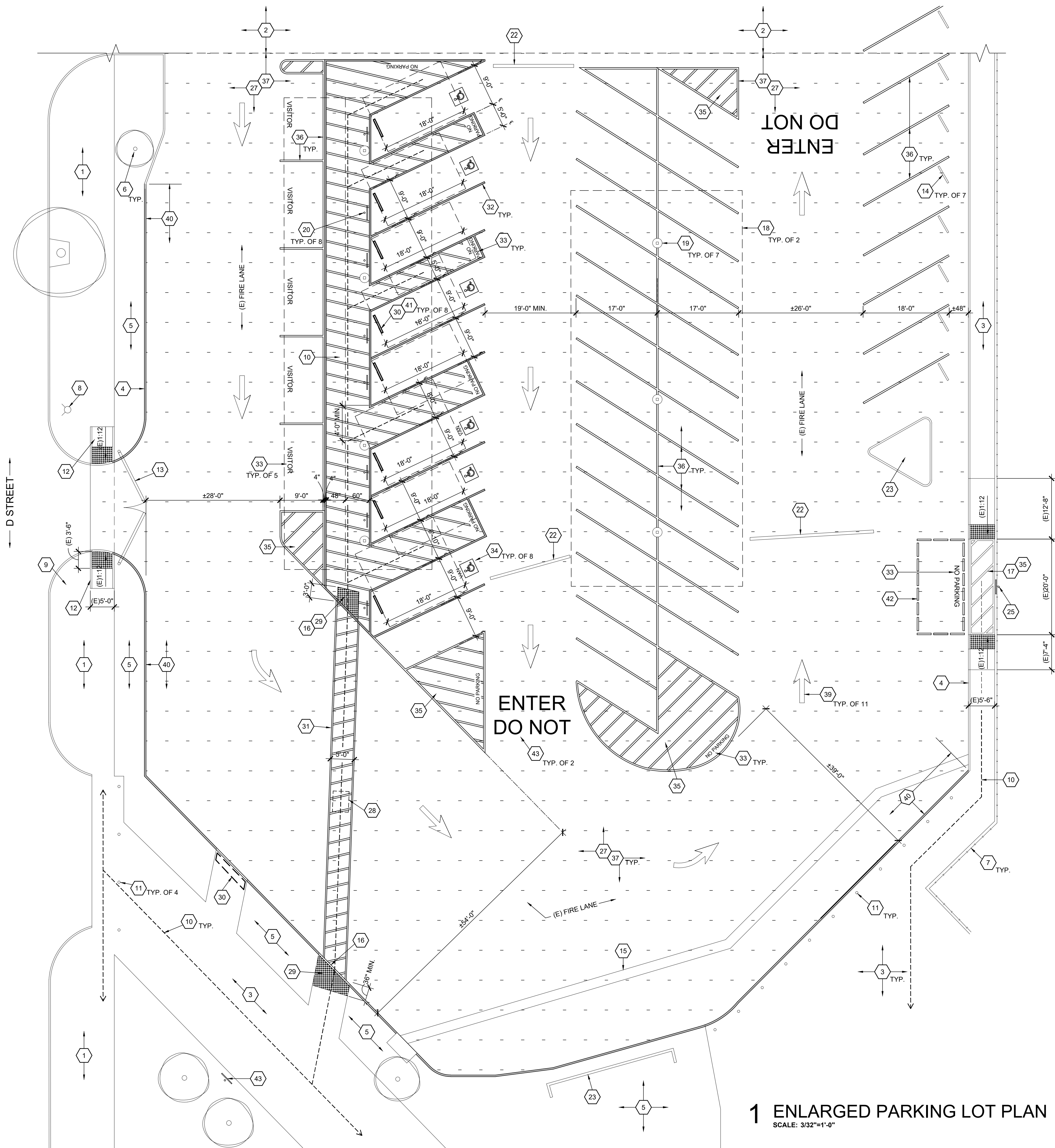
JOB NUMBER: 12.01.04
DATE:01/14/2022

REVISION: DATE: _____

REVISION:  DATE: _____

DRAWING TITLE:
HVAC ENCLOSURE
ROOF PLAN &
SITE DETAILS

DRAWING NO.:



1 ENLARGED PARKING LOT PLAN
SCALE: 3/32"=1'-0"



KEYNOTES

- EXISTING PUBLIC CONCRETE SIDEWALK TO REMAIN
- EXISTING ASPHALTIC CONCRETE PAVING TO REMAIN, NO WORK
- EXISTING ACCESSIBLE CONCRETE SIDEWALK TO REMAIN
- EXISTING CONCRETE CURB TO REMAIN
- EXISTING TURF/ LANDSCAPE BED TO REMAIN
- EXISTING TREE TO REMAIN
- EXISTING C.L. FENCE TO REMAIN
- EXISTING FIRE HYDRANT TO REMAIN
- EXISTING TOW-AWAY SIGN, TO REMAIN (A#03-117155) , RE: 10/A1.4
- EXISTING ACCESSIBLE (< 2% ALL DIRECTIONS) PATH OF TRAVEL (A#03-117115)
- EXISTING BOLLARDS TO REMAIN
- EXISTING ACCESSIBLE CITY OF LAVERNE CURB RAMP
- EXISTING 20' W. GATE TO REMAIN
- EXISTING CONCRETE WHEEL STOP TO REMAIN
- EXISTING CONCRETE SWALE TO REMAIN
- EXISTING FLUSH TRANSITION
- EXISTING ACCESSIBLE DROP-OFF ZONE, CURB RAMP AND TRUNCATED DOMES (A# 03-107966)
- EXISTING SOLAR PANELS TO REMAIN(A#03-117155)
- EXISTING SCHOOL PANEL COLUMN TO REMAIN (A#03-117115)
- EXISTING ACCESSIBLE PARKING STALL SIGN AND POST, RE: (A#03-117155)
- NOT USED
- EXISTING ASPHALT SPEED BUMP, PAINT YELLOW
- EXISTING RAISED CONCRETE ISLAND TO REMAIN
- EXISTING SCHOOL MARQUEE SIGN TO REMAIN
- EXISTING ACCESSIBLE DROP-OFF SIGN (A#03-107966)
- NOT USED
- BLACK-OUT ALL EXISTING PAINTED (YELLOW, WHITE AND BLUE) STRIPING, SYMBOLS AND LETTERING PRIOR TO NEW SEAL COAT
- REMOVE EXISTING SURFACE MOUNTED TRUNCATED DOMES, REPAIR PAVING
- REMOVE AND REPLACE EXISTING SURFACE MOUNTED TRUNCATED DOMES, RE: 6/A1.4
- REMOVE AND SALVAGE EXISTING CONCRETE WHEEL STOP
- NEW ACCESSIBLE (EXISTING < 2% ALL DIRECTIONS) CROSSWALK WITH PAINTED WHITE 4" BORDER AND DIAGONAL STRIPING AT 36" O.C.
- NEW 4" W. PAINTED BORDER BLUE (FEDERAL STD. 595C, COLOR:15090) PARKING STALL LINE
- NEW 12" H. PAINTED WHITE TRAFFIC CONTROL WORDS, RE: 12/A1.4
- NEW 36" SQ. PAINTED ACCESSIBLE PARKING STALL SYMBOL, RE: 11/A1.4
- NEW 4" W. BORDER AND DIAGONAL STRIPING AT 36" O.C., PAINT WHITE
- NEW 4" W. PARKING STALL STRIPE, PAINT WHITE
- NEW CRACK-FILLER AND (2) APPLICATIONS OF SEAL COAT
- NEW 12" W. PAINTED WHITE STRIPE
- NEW TRAFFIC CONTROL SYMBOL, PAINT YELLOW, RE: 12/A1.4
- NEW PAINTED RED (FIRE LANE) FULL LENGTH OF EXISTING CONCRETE CURB AS INDICATED
- RE-INSTALL EXISTING SALVAGED CONCRETE WHEEL STOP, INCLUDE 3 NEW DUE TO BREAKAGE DURING SALVAGE REMOVAL, RE: 5/A1.4
- NEW 4" W. X 36" PAINTED WHITE DASHED LINE
- NEW SAFE DISPERSAL AREA SIGN, RE: 9C/A1.4

LEGEND

- NEW CRACK FILLER AND SEAL COAT ON EXISTING ASPHALT PAVING
- NEW 4" W. PAINTED FEDERAL BLUE PARKING STALL STRIPING
- PAINT EXISTING CONCRETE CURB RED
- EXISTING ACCESSIBLE PATH OF TRAVEL (A#03-117115)

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PROJECT:

BONITA H.S.
GYMNASIUM HVAC
REPLACEMENT

JOB NUMBER: 12.01.04

DATE: 01/14/2022

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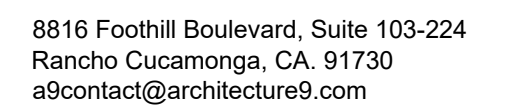
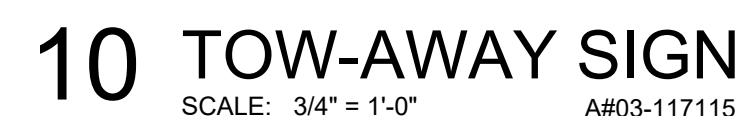
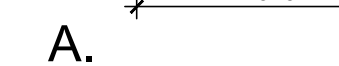
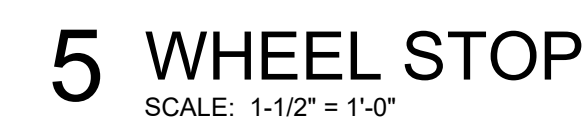
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DRAWING TITLE:

ENLARGED
PARKING
LOT PLAN

DRAWING NO.:

A1.3



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SCHOOL DISTRICT

PROJECT:

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SCHOOL
GYMNASIUM HVAC

JOB NUMBER: 12.01.04

DATE: 01/14/2022

REVISION: $\triangle 1$ DATE:

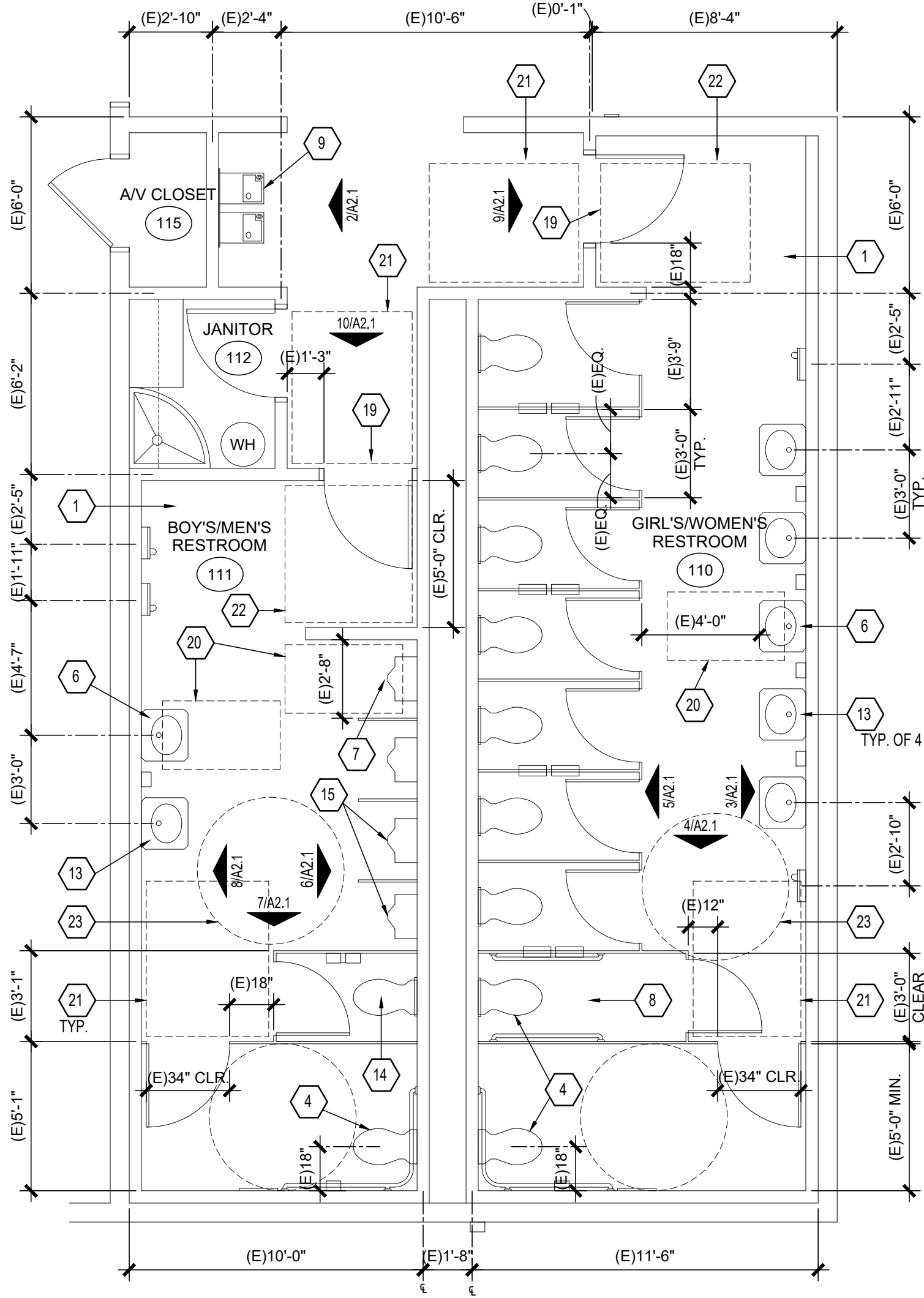
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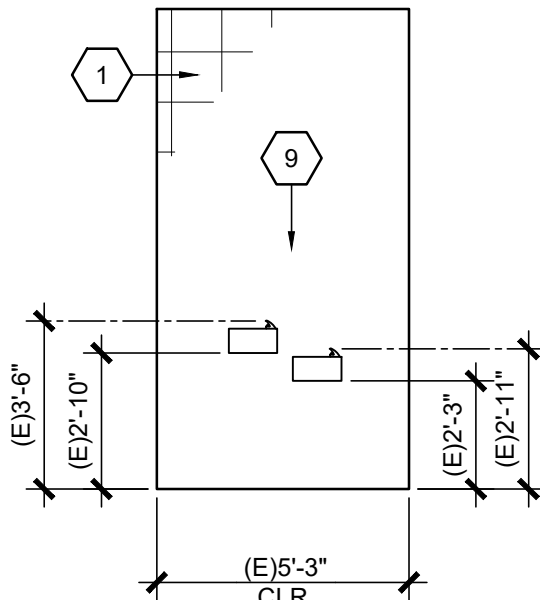
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DRAWING NO.:

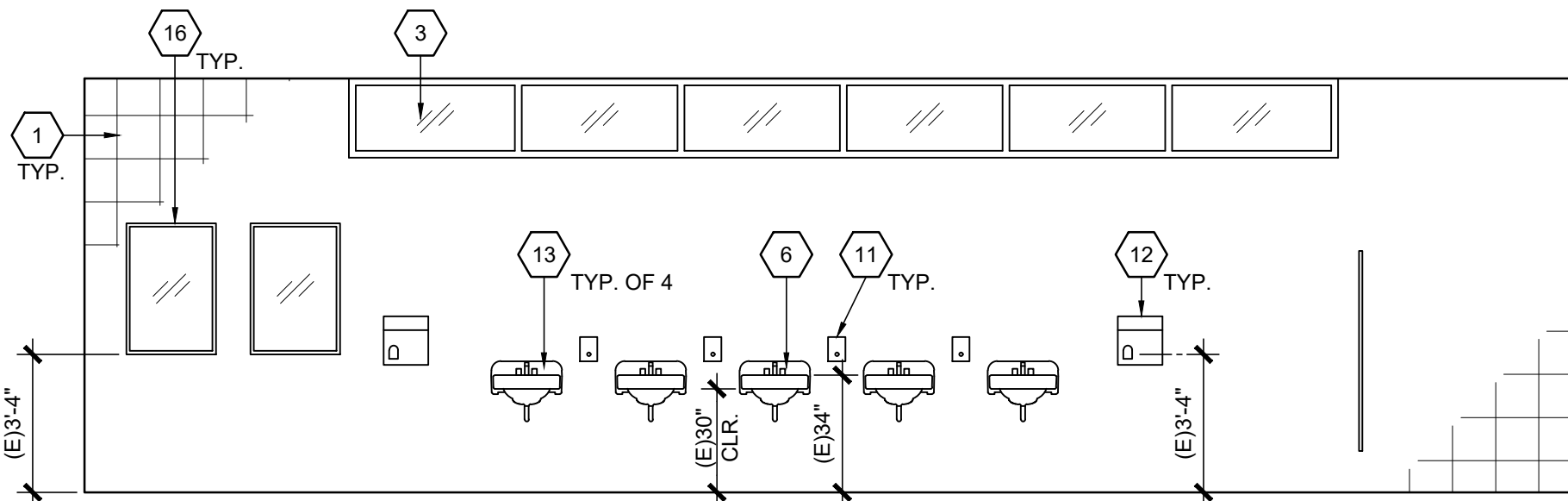
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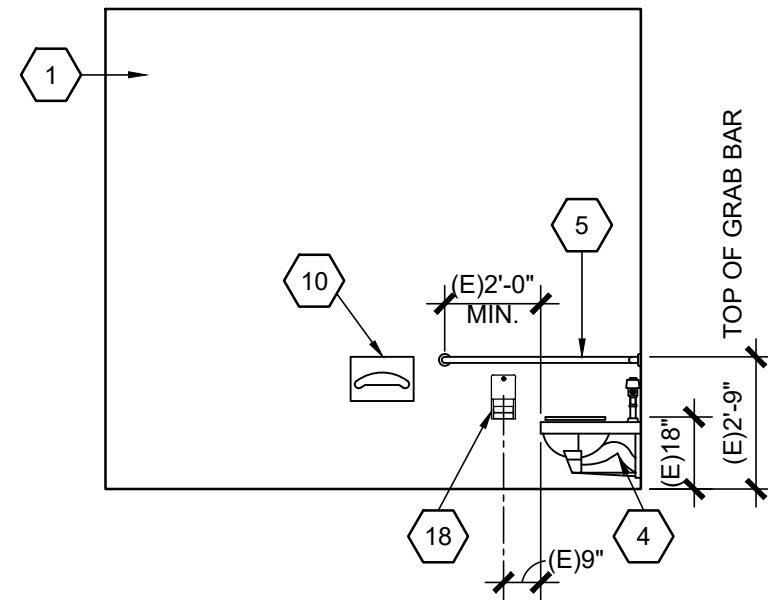
1 ENLARGED FLOOR PLAN
SCALE: 1/4" = 1'-0"
A#03-113305
NORTH



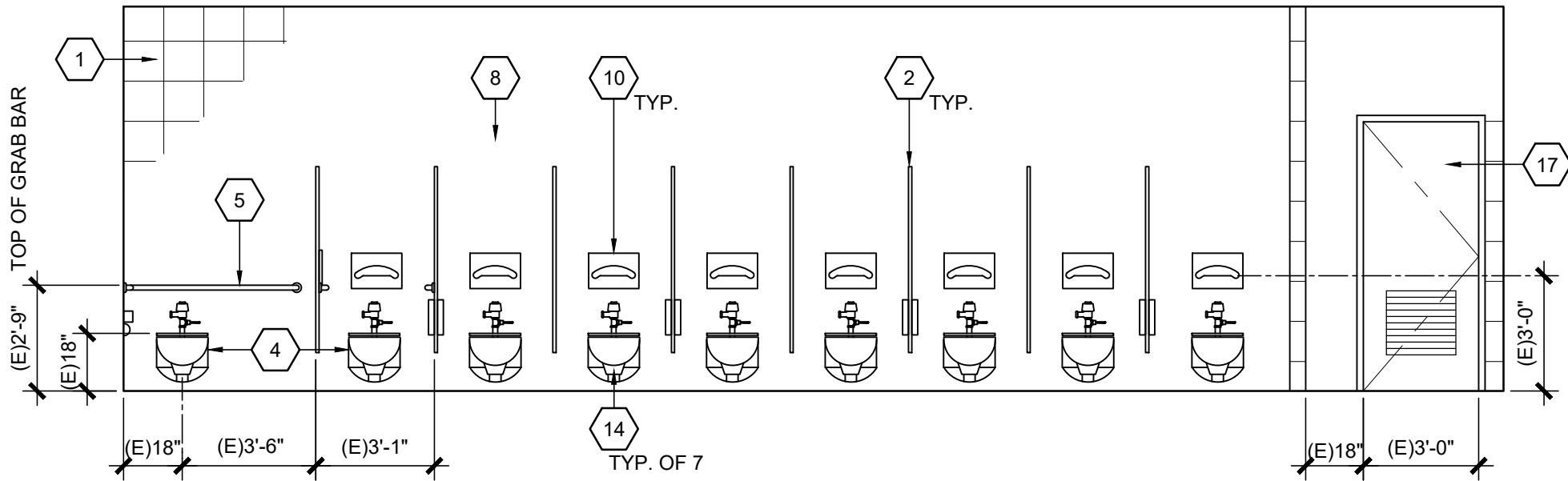
2 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113305



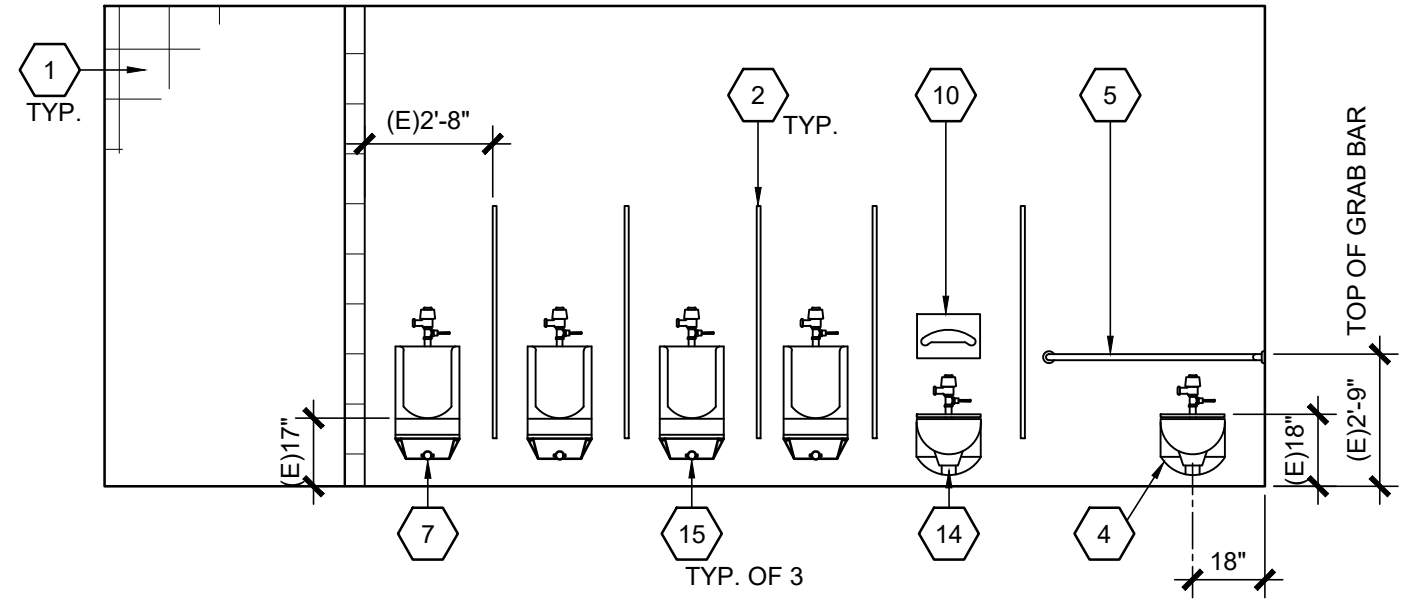
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SCALE: 1/4" = 1'-0"
A#03-113305



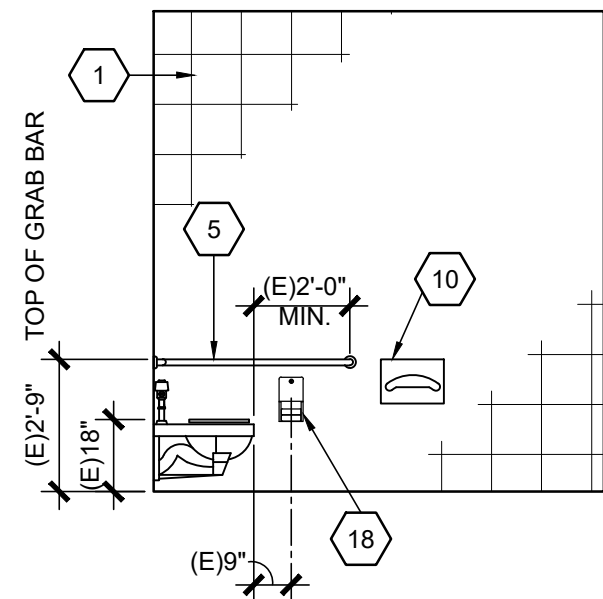
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A#03-113305



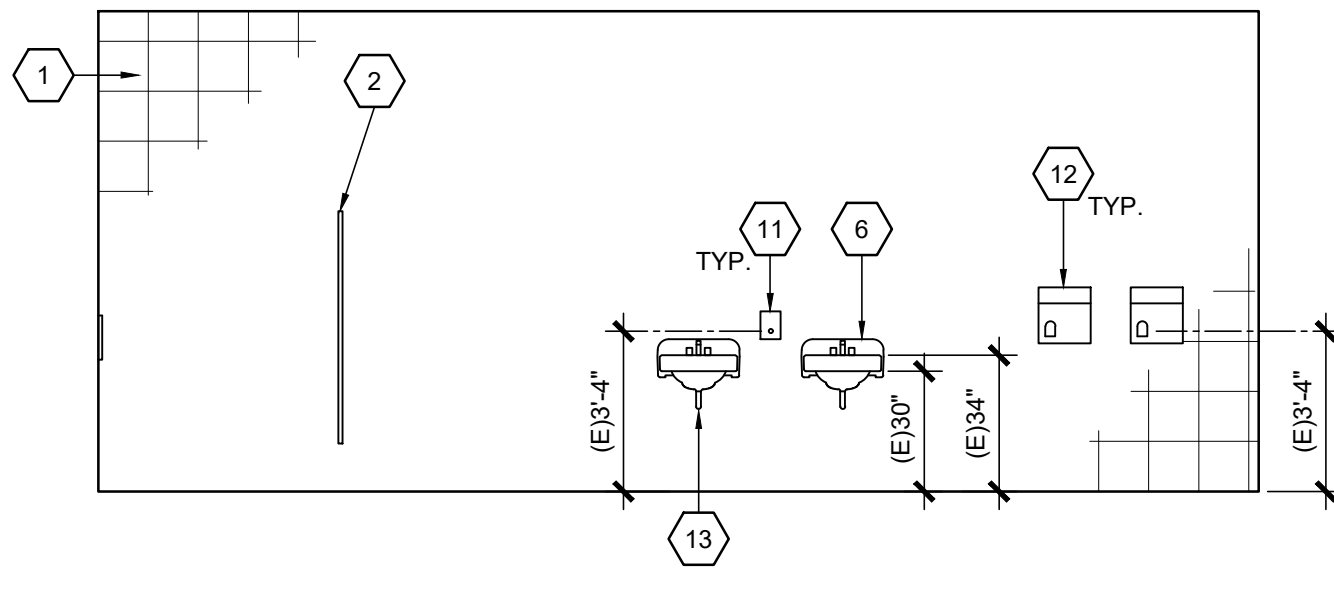
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SCALE: 1/4" = 1'-0"
A#03-113305



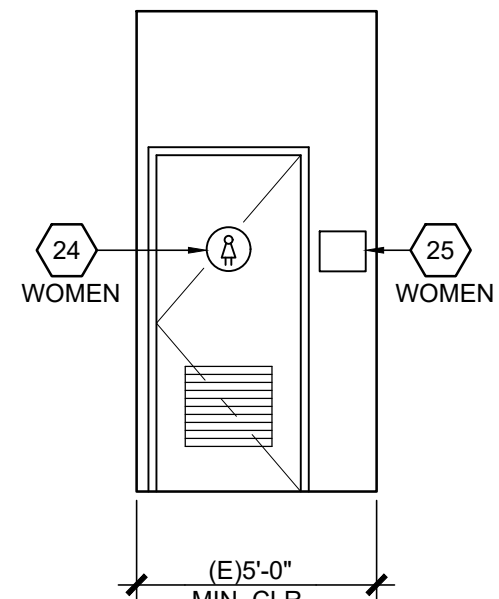
6 ELEVATION
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A#03-113305



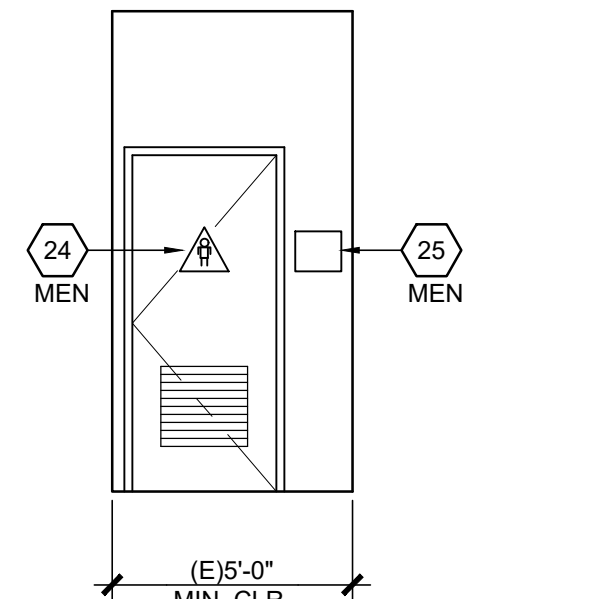
7 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113305



8 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113305



9 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113305



10 ELEVATION
SCALE: 1/4" = 1'-0"
A#03-113305

KEYNOTES: 1

- EXISTING CERAMIC TILE TO REMAIN
- EXISTING TOILET PARTITION TO REMAIN
- EXISTING WINDOWS TO REMAIN, CLEAN
- EXISTING ACCESSIBLE WATER CLOSET TO REMAIN (A# 03-113305)
- EXISTING ACCESSIBLE GRAB BARS TO REMAIN (A# 03-113305)
- EXISTING ACCESSIBLE LAVATORY TO REMAIN (A# 03-113305)
- EXISTING ACCESSIBLE URINAL TO REMAIN (A#04-113305)
- EXISTING ACCESSIBLE ABULATORY STALL TO REMAIN (A#04-113305)
- EXISTING ACCESSIBLE HIGH/LOW DRINKING FOUNTAIN TO REMAIN (A# 03-113305)
- EXISTING TOILET SEAT COVER DISPENSER TO REMAIN
- EXISTING SOAP DISPENSER TO REMAIN
- EXISTING ELECTRIC HAND DRYER TO REMAIN
- EXISTING STANDARD LAVATORY TO REMAIN
- EXISTING STANDARD WATER CLOSET TO REMAIN
- EXISTING MIRROR TO REMAIN
- EXISTING DOOR TO REMAIN
- EXISTING SEMI-RECESSED TOILET PAPER DISPENSER TO REMAIN
- EXISTING WALL AND DOOR SIGNAGE TO REMAIN, RE: 9 & 10/A2.1
- 30" X 48" CLEAR SPACE
- 48" X 60" CLEAR SPACE
- 54" X 60" CLEAR SPACE
- 5" DIA. TURNING RADIUS
- REMOVE AND REPLACE EXISTING DOOR SIGNAGE, RE: A3.1
- REMOVE AND REPLACE EXISTING WALL SIGNAGE WITH BRAILLE, RE: A3.1

MOUNTING HEIGHTS AND CLEARNCES

Alternative Dimensions for Children's Use	
User Group	Adult
Toilet Offset	17"-18"
Toilet Seat Height	17"-19"
Top of Grab Bar	33"-36"
Toilet Paper Dispenser Outlet	19" min.
Furthest T.P. Dispenser in front of W. C.	7'-9" centerline
Lav/Sink Rim Height	34" max.
Lav/Sink Knee Clearance	27" min. - 29" min. @apron for Lav.
Urinal Height	17" max.
Urinal Projection	13-1/2" min.
Urinal Flush Control Height	44" max.
High Drinking Fountain Spout Height	38"-43"
Low Drinking Fountain approach, Spout Height and Spout location from Front Edge of the Unit including Bumpers	Front approach per 119-306; 36" max. A.F.F., 5" max. from front of unit
Drinking Fountain Operating Parts	6" max. fron front edge of unit
Canilever Drinking Fountain Projection	18"-19"
Toe Clearance at Toilet Partition	9" min.
Shelf Height	40"-48"
Mirror Height (Bottom Edge of Reflecting Surface)	40" max. (above lav. Or counter top); 35" max. (not above lav. Or counter top)
Mirror Height (Bottom Edge of Reflecting Surface) in dressing, fitting & locker rooms	20" Max.

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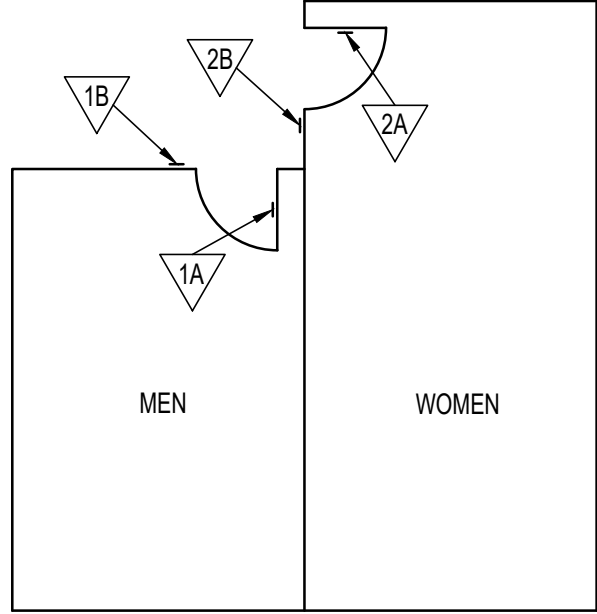
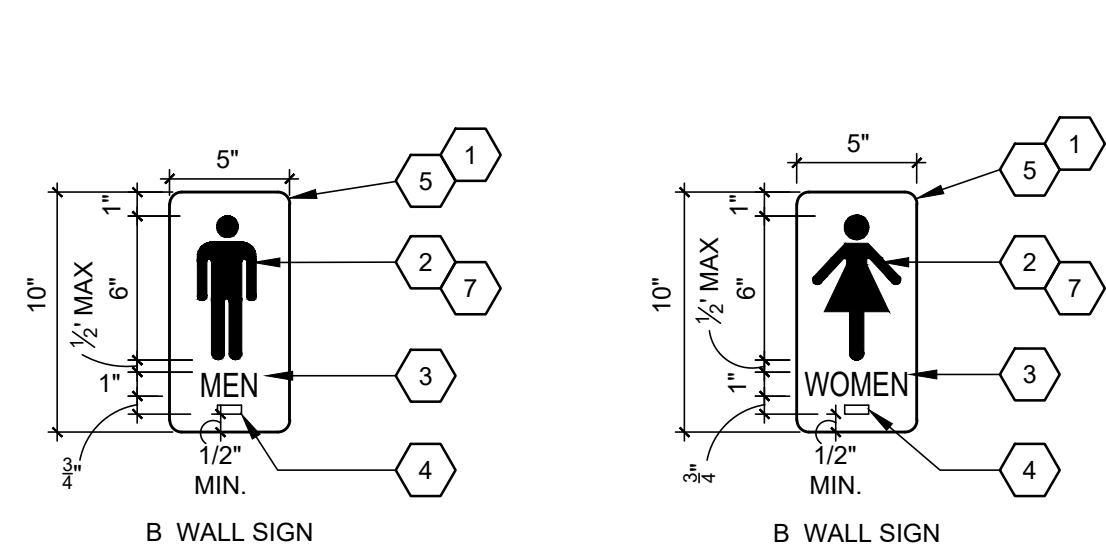
JOB NUMBER: 12.01.04
DATE: 01/14/2022

REVISION: 1 DATE: _____
REVISION: 2 DATE: _____

DRAWING TITLE:
ENLARGED
FLOOR PLAN &
ELEVATIONS

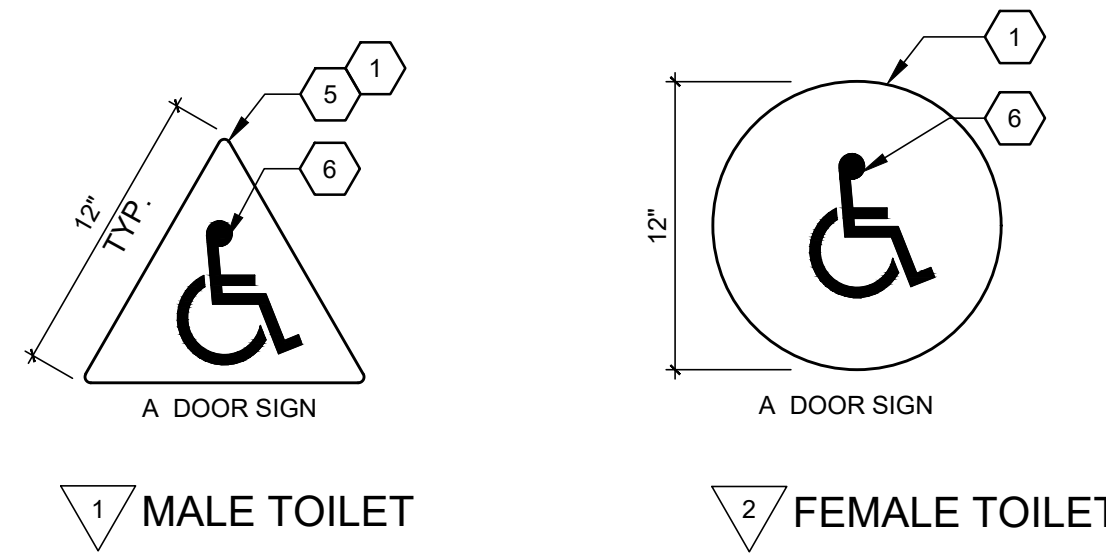
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A2.1



2 SIGNAGE PLAN

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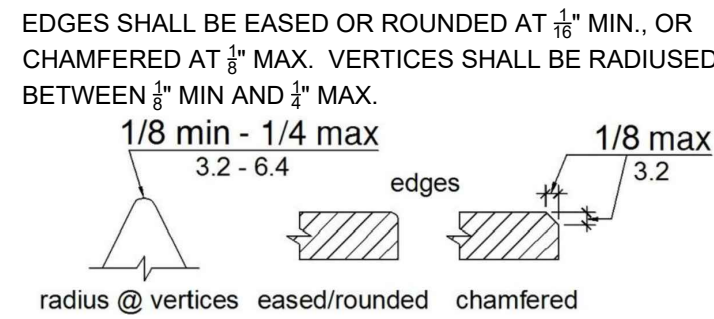


1 SIGNAGE TYPES

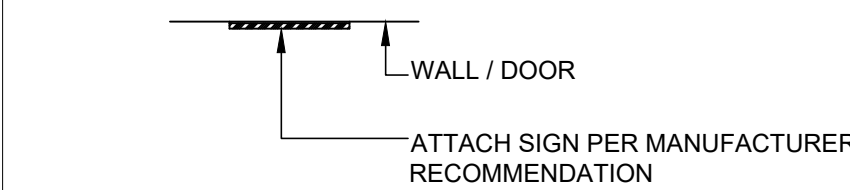
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3 SIGN DETAIL

SCALE: N.T.S.

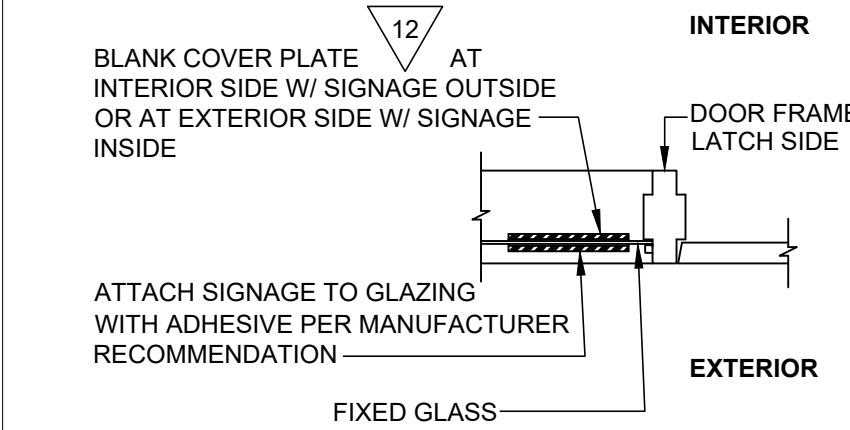


MOUNTING DETAILS



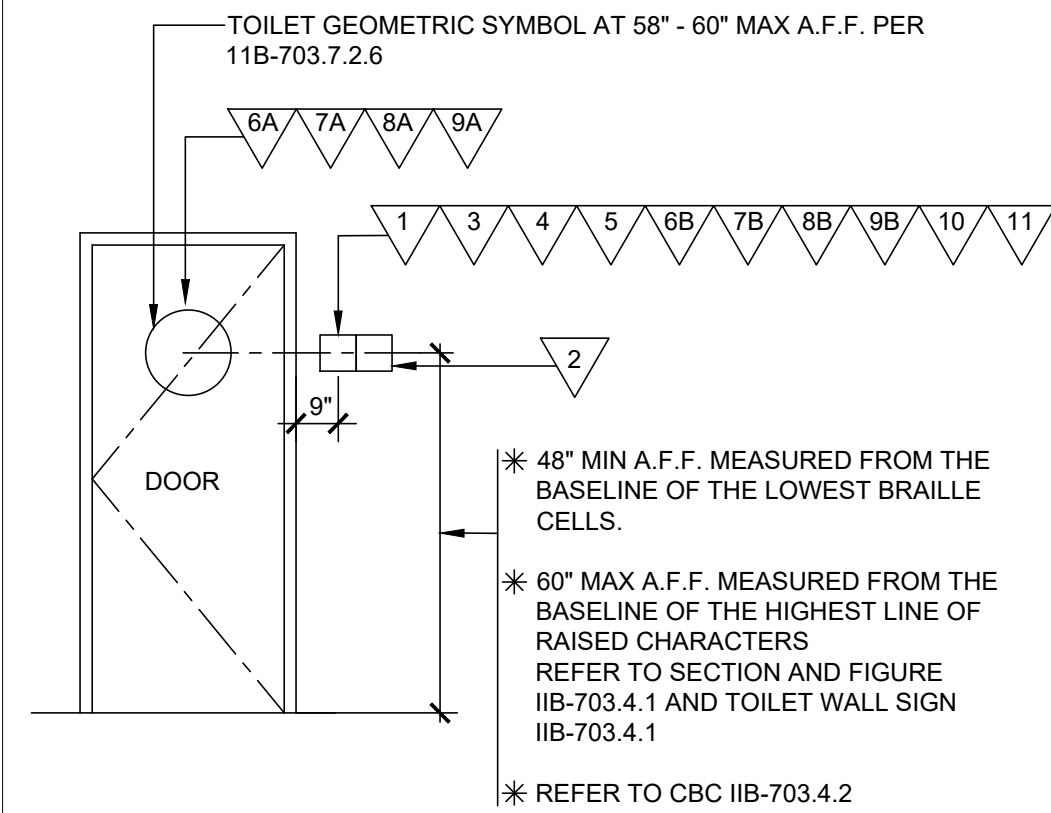
4 WALL OR DOOR MOUNTED SIGNS

SCALE: 1 1/2" = 1'-0"



5 GLASS MOUNTED SIGNS

SCALE: 1 1/2" = 1'-0"



6 DOOR SIGNAGE LOCATIONS

SCALE: NO SCALE

GENERAL NOTES

- A. REFER TO DRAWING A1.2 FOR BUILDING AND PERPENDICULAR POST SIGN LOCATIONS

KEYNOTES

- EDGES SHALL BE EASED OR ROUNDED AT 1/16" MIN., OR CHAMFERED AT 1/8" MIN., RE: 3/A3.1
- RAISED PICTORIAL SYMBOL, 6" HIGH MIN & RAISED 1/32" MINIMUM, COLOR TO BE WHITE
- RAISED TEXT, RAISED 1/32" MINIMUM, TEXT TO MATCH FLOOR PLAN, RE: 2/A3.1
- CALIFORNIA BRAILLE, CONTRACTED GRADE 2, REFER TO TABLE IIB-703.3.1
- RADIUS CORNER TYPICAL, 1/8" MIN. AND 1/4" MAX, RE: 3/A3.1
- 6" HIGH INTERNATIONAL SYMBOL OF ACCESSIBILITY (ISA) SYMBOL TO BE WHITE, BACKGROUND TO BE GREEN
- BACKGROUND TO BE COLOR GREEN

GENERAL SIGNAGE REQUIREMENTS

CODE REQUIREMENTS:

- FLOOR LEVEL EXIT SIGNS: PER CBC 1011.6 AND 1011.7
- GENERAL REQUIREMENTS: PER CBC 11B-216.1 AND 11B-703.1
- SYMBOLS OF ACCESSIBILITY: PER CBC 11B-703.7.2
- TACTILE EXIT SIGNS: PER CBC 1011.4
- ASSISTIVE LISTENING SYSTEM SIGNAGE: PER CBC 11B-219.2

SIGN CONSTRUCTION AND SIZE:

- SIGN CONSTRUCTION: PLASTIC WITH MILLED TEXT, SYMBOLS AND BRAILLE. CHEMICALLY WELDED R ADHESIVE APPLIED TEXT, SYMBOLS AND/OR BRAILLE IS NOT ACCEPTABLE.
- FINISH AND CONTRAST: TEXT, SYMBOLS AND THEIR BACKGROUND SHALL HAVE A NON-GLARE FINISH. TEXT AND SYMBOLS SHALL HAVE CONTRAST WITH THEIR BACKGROUND PER 11B-703.5.1 FOR VISUAL CHARACTERS, 11B-703.6.2 FOR PICTOGRAMS, 11B-703.7.1 FOR SYMBOLS OF ACCESSIBILITY.
- SIZES OF SIGNS SHALL BE AS DETAILED PER DRAWING A3.1.

PICTORIAL SYMBOLS FOR RESTROOMS AND VISUAL CHARACTERS:

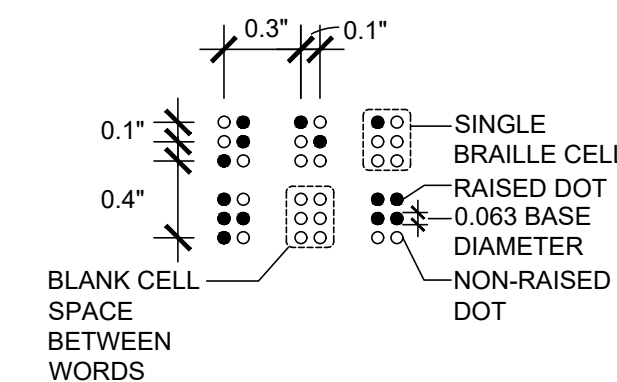
- TYPE: RAISED 1/32" MINIMUM
- HEIGHT: 6" MINIMUM
- TEXT DESCRIPTORS: TEXT SHALL BE LOCATED DIRECTLY BELOW THE PICTOGRAM FILED AND SHALL COMPLY WITH TACTILE TEXT CHARACTERS AND BRAILLE REQUIREMENTS THIS PAGE
- VISUAL CHARACTERS SHALL COMPLY WITH CBC SECTION IIB-703.5 AND SHALL BE 40" MIN. ABOVE FINISH FLOOR OR GROUND
- PICTOGRAMS SHALL COMPLY WITH CBC SECTION IIB-703.6
- SYMBOLS OF ACCESSIBILITY SHALL COMPLY WITH CBC SECTION IIB-703.7
- VARIABLE MESSAGE SIGNS SHALL COMPLY WITH CBC SECTION IIB-703.8

TACTILE TEXT CHARACTERS REQUIREMENTS:

- TYPE: UPPER CASE, SANS SERIF PER 11B-703.2.3, NO ITALIC, OBLIQUE, SCRIPT, HIGHLY DECORATIVE OR UNUSUAL FORMS PER 11B-703.2.2 AND 11B-703.2.3
- RAISED CHARACTERS: 1/32" MINIMUM PER 11B-703.2
- CHARACTER PROPORTIONS: WIDTH OF THE UPPERCASE "O" IS 60 PERCENT MINIMUM AND 110 PERCENT. MAXIMUM OF HEIGHT OF THE UPPERCASE LETTER "I" PER 11B-703.2.4
- STROKE THICKNESS: UPPERCASE LETTER "I" SHALL BE 15 PERCENT MAXIMUM OF THE HEIGHT OF THE CHARACTER PER 11B-703.2.6
- HEIGHT: 5/8" MINIMUM TO 2" MAXIMUM PER 11B-703.2.5
- CHARACTER SPACING: PER 11B-703.2.7 AND IIB-703.2.8, 1/8 INCH MINIMUM AND 4 TIMES THE RAISED CHARACTER STROKE WIDTH MAXIMUM. CHARACTERS SHALL BE SEPARATED FROM RAISED BORDERS AND DECORATIVE ELEMENTS 3/8" MINIMUM
- FORMAT: TEXT SHALL BE IN A HORIZONTAL FORMAT: CBC SECTION IIB-703.2.9

CALIFORNIA BRAILLE REQUIREMENTS:

CONTRACTED CALIFORNIA GRADE 2 BRAILLE AND SHALL COMPLY WITH CBC SECTION IIB-703.3 AND IIB-703.4, RAISED 1/40" MINIMUM AND 0.037" MAXIMUM ABOVE THE BACKGROUND, ROUNDED DOTS SHALL BE 1/10-INCH ON CENTERS IN EACH CELL WITH 2/10-INCH SPACE BETWEEN CELLS, MEASURED FROM THE SECOND COLUMN OF DOTS IN THE FIRST CELL TO THE FIRST COLUMN OF DOTS IN THE SECOND CELL WITH ROUNDED OR DOME TOPS, REFER TO 2019 CBC TABLE 11B-703.3.1 AND FIGURE 11B-703.3.1



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ARCHITECTS STAMP:



CONSULTANT:

CONSULTANTS STAMP:

SCHOOL DISTRICT:

BONITA UNIFIED
SCHOOL DISTRICT

PROJECT:

BONITA HIGH
SCHOOL
GYMNASIUM HVAC

JOB NUMBER:

12.01.04

DATE: 01/14/2022

REVISION:

DATE: _____

REVISION: _____ DATE: _____

DRAWING TITLE:

SIGNAGE

DRAWING NO.:

A3.1

LEGEND			
A.B.	ANCHOR BOLT	H.A.B.	HEADED ANCHOR BOLT
B.K.G.	BLOCKING	H.D.	HOLD DOWN
B.M.	BEAM	HORIZ.	HORIZONTAL
B.N.	BOUNDARY NAILING	H.S.A.	HEADED STUD ANCHOR
B.O.B.	BOTTOM OF BEAM	H.S.B.	HIGH STRENGTH BOLT
B.S.	BOUNDARY SCREIN	H.S.S.	HOLLOW STRUCTURAL SECTION
C.	CAMBER	JST.	JOIST
C.B.	CARRIAGE BOLT	LT. HT.	LIGHT HEIGHT
C.L.R.	CLEAR	M.S.	MASONRY
C.L.	CONSTRUCTION JOINT	M.B.	MACHINE BOLT
C.N.	CONT. NAILING	(N)	NEM
COL.	COLUMN	N.S.	NEAR SIDE
CONC.	CONCRETE	N.T.S.	NOT TO SCALE
CONJ.	CONNECTION	O.C.	ON CENTER
CONT.	CONTINUOUS	O.H.	OPPOSITE HAND
C.P.	COMPLETE PENETRATION	OPNG.	OPENING
C.P.E.	CONT. PANEL EDGES	P.J.	FOUR JOINT
D.B.A.	DEFORMED BAR ANCHOR	PLT.	PLATE
DBL.	DOUBLE	PLYND.	PLYWOOD
D.B.	DRAG BAR	P.T.	PRESSURE TREATED
DIA.	DIAMETER	REQD.	REQUIRED
DO.	DITTO	REM.	REMAINDER
DRWG.	DRAWING	R.S.	ROUGH SAWN
E.A.	EACH	SHTG.	SHEATHING
ELEV.	ELEVATION	S.J.	SEPARATION JOINT
(E)	EXISTING	S.Q.	SQUARE
E.J.	EXPANSION JOINT	SIM.	SIMILAR
E.N.	EDGE NAILING	S.M.	SHEET METAL
E.S.	EDGE SCREIN	S.P.	SEE PLAN
EQ.	EQUAL	STAGG.	STAGGERED
EXT.	EXTERIOR	STD.	STANDARD
FDN.	FOUNDATION	STL.	STEEL
F.G.	FINISH GRADE	STL. JOIST.	STEEL JOIST
F.H.M.S.	FLAT HEAD WOOD SCREWS	T.B.	TOP AND BOTTOM
F.N.	FIELD NAILING	T.O.C.	TOP OF CONCRETE
F.O.C.	FACE OF CONCRETE	T.O.M.	TOP OF MASONRY
F.O.M.	FACE OF MASONRY	T.O.M.D.	TOP OF METAL DECK
F.O.S.	FACE OF STUD	T.O.P.	TOP OF PLYWOOD
F.S.	FAR SIDE	T.O.P.A.R.	TOP OF PARAPET
FRMG.	FRAMING	T.O.S.	TOP OF STEEL
FTG.	FOOTING	T.S.	TUBE STEEL
GALV.	GALVANIZED	TYP.	TYPICAL
GA.	GAUGE	UNO.	UNLESS NOTED OTHERWISE
G.L.B.	GLUE LAMINATED BEAM	VERT.	VERTICAL
GYP. BD.	GYPSON BOARD	W.P.J.	WEAKENED PLANE JOINT
		W.S.	WELDED ALL THREAD STUD
		W.F.	WELDED WIRE FABRIC
		W.O.	WHERE OCCURS
	DETAIL REFERENCE DETAIL NUMBER SHEET NO. WHERE DRAWN		STEP FOOTING
	WALL ELEVATION WALL ELEVATION LETTER SHEET NO. WHERE DRAWN		REFERENCE ELEVATION
	WALL SECTION WALL SECTION LETTER SHEET NO. WHERE DRAWN		REFERENCE ELEVATION TO TOP OF FOOTING

SPECIAL INSPECTION (STEEL):				
1. SPECIAL INSPECTION OF FABRICATORS PER SECTION 1105A.2.				
2. INSPECTION OF ALL SHOP AND FIELD WELDING OPERATIONS, INCLUDING THE INSTALLATION OF AUTOMATIC END WELDED STUD SHEAR CONNECTORS, SHALL BE MADE BY AN AWS-CERTIFIED WELDING INSPECTOR APPROVED BY THE ENFORCEMENT AGENCY AS DEFINED IN SECTION 1105A.2.5.				
3. SPECIAL INSPECTION FOR SPRAYED FIRE-RESISTANT MATERIALS PER SECTION 1105A.4.				
4. SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION SHALL BE AS DEFINED IN C.B.C. SECTION 1105A.2 AND TABLE 1105A.2.1 BELOW AND AS NOTED ON THE CONSTRUCTION DOCUMENTS.				
REQUIRED SPECIAL INSPECTION AND TEST OF STEEL CONSTRUCTION (TABLE 1105A.2.1)				
TYPE	CONTINUOUS SPEC. INSP.	PERIODIC SPEC. INSP.	REFERENCED STANDARD ^a	C.B.C. REFERENCE
1. MATERIAL IDENTIFICATION AND TESTING OF HIGH STRENGTH BOLTS, NUTS AND WASHERS:				
a. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	---	X	RCs: 15, AISC 360: A5.3, J5.1 AND APPLICABLE ASTM MATERIAL STANDARDS	2202A.1 [DSA-55/CG] 2202.1
b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	---	X	RCs: 15 & 2.1; AISC 360: A3.3 & NS.2	---
c. TESTING OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS.	---	---	RCs: 12 APPLICABLE ASTM MATERIAL STANDARDS	---
2. INSPECTION OF HIGH-STRENGTH BOLTING:				
a. SNUG-TIGHT JOINTS.	---	X	RCs: 7-4, AISC 360: J5.1, J5.2, M2.5 & NS.6	1105A.2.6, 2204A.2, [DSA-55/CG] 2212.6.1
b. PRETENSIONED AND SLIP-CRITICAL JOINTS USING TURN-OF-NUT WITH MATCHMARKING, TWIST-OFF BOLT OR DIRECT TENSION INDICATOR METHODS OF INSTALLATION	---	X		
c. PRETENSIONED AND SLIP-CRITICAL JOINTS USING TURN-OF-NUT WITHOUT MATCHMARKING OR CALIBRATED WRENCH METHODS OF INSTALLATION.	X	---		
3. MATERIAL IDENTIFICATION AND TESTING OF STRUCTURAL STEEL AND COLD-FORMED STEEL DECK:				
a. FOR STRUCTURAL STEEL, IDENTIFICATION MARKINGS TO CONFORM TO AISC 360.	---	X	AISC 360: A3.1	2202A.1, [DSA-55/CG] 2202.1
b. FOR OTHER STEEL, IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	---	X	APPLICABLE ASTM MATERIAL STANDARDS	2202A.1, [DSA-55/CG] 2202.1
c. MANUFACTURER'S CERTIFIED TEST REPORTS.	---	---	AISC 360: A3.1 & NS.2	---
d. TESTING OF UNIDENTIFIED STEEL.	---	X	APPLICABLE ASTM MATERIAL STANDARDS	2202A.1, [DSA-55/CG] 2202.1
4. MATERIAL IDENTIFICATION OF WELDING CONSUMABLES AND TESTING OF WELDED ELEMENTS:				
a. STRUCTURAL STEEL AND COLD-FORMED STEEL DECK:	---	X	AISC 360: A3.5 & NS.2 AND APPLICABLE AWS AS DOCUMENTS	---
b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	---	X	AISC 360: NS.2	---
c. NONDESTRUCTIVE TESTING OF WELDED JOINTS.	---	---	AISC 360: NS.5	---
5. INSPECTION OF WELDING:				
a. STRUCTURAL STEEL AND COLD-FORMED STEEL DECK:				
1. COMPLETE AND PARTIAL JOINT PENETRATION GROOVE WELDS.	X	---	AISC 360: J2, M2.4, & M4.5, AWS D1.1 AWS D1.8	1105A.2.1, 1105.2.5
2. MULTIPASS FILLET WELDS.	X	---		
3. SINGLE-PASS FILLET WELDS LARGER THAN 5/16".	X	---		
4. FLUGS AND SLOT WELDS.	---	X		
5. SINGLE-PASS FILLET WELDS LESS THAN OR EQUAL TO 5/16".	---	X		
6. FLOOR AND ROOF DECK WELDS.	---	X	AWS D1.3, SDI GA/GC	1105A.2.1, 1105A.2.2, 1105A.2.3
7. END-WELDED STUDS.	---	X	1105A.2.5, 2215A.2, [DSA-55/CG] 2212.6.2	
8. WELDED SHEET STEEL FOR COLD-FORMED FRAMING MEMBERS.	---	X	AWS D1.1	1105A.2.5, 1105A.2.4.1
6. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE:				
a. DETAILS SUCH AS BRACING AND STIFFENINGS.	---	X	AISC 360: NS.9	1105A.2.1
b. MEMBER LOCATIONS.	---	X		
c. NONDESTRUCTIVE TESTING OF WELDED JOINTS.	---	X		

^a WHERE APPLICABLE, SEE ALSO SECTION 1105A.1.2, SPECIAL INSPECTION FOR SEISMIC RESISTANCE.

- METAL DECKING:**
- STEEL MATERIAL FOR THE DECK UNITS SHALL CONFORM TO ASTM A-653.
 - ROOFS-VERCO 115.5-36" OR EQ. 11-30,000 P.S.I. (AHPM-ER 2016)
 - ALL DECK UNITS SHALL BE WITH A (660) GALVANIZED COATING FOR INTERIOR NOT EXPOSED TO WEATHER AND (960) FOR EXTERIOR EXPOSED TO WEATHER.
 - WELDING SHALL BE WITH E60 OR E70 ELECTRODE AND PERFORMED BY CERTIFIED, LICENSED LIGHT GAUGE WELDER PER AWS D13.

SPECIAL INSPECTIONS:

- GENERAL:** THE OWNER SHALL EMPLOY ONE OR MORE APPROVED AGENCIES TO PERFORM INSPECTIONS DURING CONSTRUCTION ON THE TYPES OF WORK LISTED UNDER SECTION 1105A. THESE INSPECTIONS ARE IN ADDITION TO THE INSPECTIONS IDENTIFIED IN SECTION 110. THE SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE BUILDING OFFICIAL, FOR THE INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION.
- REPORT REQUIREMENT:** THE INSPECTOR OF RECORD AND SPECIAL INSPECTORS SHALL KEEP RECORDS OF INSPECTIONS. THE INSPECTOR OF RECORD AND SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL, AND TO THE REGISTERED DESIGN PROFESSIONAL, IN RESPONSIBLE CHARGE, AS REQUIRED BY TITLE 24, PART 1. REPORTS SHALL INDICATE THAT WORK INSPECTED WAS OR WAS NOT COMPLETED IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS AS REQUIRED BY TITLE 24, PARTS 1 AND 2. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THEY ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE BUILDING OFFICIAL, AND TO THE REGISTERED DESIGN PROFESSIONAL, IN RESPONSIBLE CHARGE, PRIOR TO THE COMPLETION OF THAT PHASE OF THE WORK. A FINAL REPORT DOCUMENTING REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED AT A POINT IN TIME AGREED UPON PRIOR TO THE START OF WORK BY THE APPLICANT AND THE BUILDING OFFICIAL.

STRUCTURAL OBSERVATION:

- VISUAL OBSERVATION OF THE STRUCTURAL SYSTEM SHALL BE PROVIDED BY THE STRUCTURAL ENGINEER OF RECORD FOR GENERAL CONFORMANCE TO THE APPROVED CONSTRUCTION DOCUMENTS. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR HAVE THE RESPONSIBILITY FOR THE INSPECTION REQUIRED BY SECTION 110, 1105A OR OTHER SECTIONS OF THE CODE. (SECTION 1102A)
- STRUCTURAL OBSERVATION SHALL BE PROVIDED BY THE STRUCTURAL ENGINEER OF RECORD AT THE FOLLOWING PHASES AS A MINIMUM.
 - UPON COMPLETION OF FOUNDATION REINFORCEMENT, IMMEDIATELY PRIOR TO CONCRETE POUR.
 - ROOF DECK WELDING AND ROOF PLYWOOD NAILING OBSERVATION.
 - ADDITIONAL VISITATION AS DEEMED NECESSARY BY THE STRUCTURAL ENGINEER OF RECORD.
- FOR ALL ITEMS THE CONTRACTOR SHALL NOTIFY THE STRUCTURAL ENGINEER 48 HOURS PRIOR TO COMPLETION OF THE WORK TO BE OBSERVED.

CONCRETE:

- THE MINIMUM STRENGTH OF CONCRETE AT END OF 28 DAYS SHALL BE:
SLABS ON GRADE ----- 4000 PSI --- 150 PCF
MAXIMUM WATER-CEMENT MATERIALS RATIO ----- 0.45
AGGREGATE SIZE ----- 3/4"
MINIMUM CEMENTITIOUS MATERIALS CONTENT ----- 540 LBS/CU. YD.
SLUMP LIMIT ----- 3" MIN, 5" MAX.
AIR CONTENT ----- USE 6% FOR VERY SEVERE AND 5% FOR MODERATE
FOOTINGS, GRADE BEAMS AND CAISSONS ----- 3500 PSI --- 150 PCF
MAXIMUM WATER-CEMENT MATERIALS RATIO ----- 0.50
AGGREGATE SIZE ----- 1"
SLUMP LIMIT ----- 4" MIN, 6" MAX.
FLY ASH ----- MAX. 15 % BY WEIGHT
FILL OVER METAL DECK ----- 3000 PSI --- 150 PCF
- REINFORCING:
 - DEFORMED REINFORCING STEEL, ASTM A615
REINFORCING GRADES: GRADE 60 (15" AND LARGER) GRADE 40 (14" AND SMALLER)
ALL REINFORCING TO BE WELDED SHALL BE ASTM A706 WELDING OF ASTM A706 GRADE 60 REINFORCING STEEL SHALL CONFORM TO AWS D14. USE E70XX ELECTRODE PER AWS A5.5.
 - PROVIDE MILL CERTIFICATE ON ALL REINFORCING STEEL. TESTING REQD ON UNIDENTIFIED REINFORCING STEEL
 - THE FOLLOWING MINIMUM CONCRETE COVERAGES SHALL BE MAINTAINED UNLESS NOTED OTHERWISE:
 - SLABS ON GRADE ----- CENTER OF SLAB
 - CONCRETE CAST AGAINST AND EXPOSED TO EARTH ----- 3"
 - CONCRETE EXPOSED TO EARTH OR WEATHER:
16" AND LARGER ----- 2"
15" AND SMALLER ----- 1 1/2"
 - CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND:
SLABS, WALLS, JOISTS:
14" AND LARGER ----- 1 1/2"
11" AND SMALLER ----- 3/4"
BEAMS AND COLUMNS:
PRIMARY REINFORCEMENT, TIES, STIRRUPS, SPIRALS ----- 1 1/2"
CONCRETE TILT-UP PANELS CAST AGAINST CONC. SLAB AND EXPOSED TO WEATHER:
14" AND LARGER ----- 2"
15" AND SMALLER ----- 1"
 - THE MINIMUM CLEAR SPACING BETWEEN PARALLEL BARS IN A LAYER SHALL BE ONE BAR DIAMETER BUT NOT LESS THAN 1 INCH.
- CONCRETE, READY-MIXED CONCRETE ASTM C94.
- CEMENT: PORTLAND CEMENT TYPE I (II LOW ALKALI); ASTM C-150
NORMAL INT. CONC. - AGGREGATES: NATURAL ROCK AND SAND: ASTM C-330
LIGHT INT. CONC. - AGGREGATES: LIGHT WEIGHT ROCK AND SAND: ASTM C-330
- EXPOSED ANCHOR BOLTS, INSERTS, ETC., SHALL BE SECURELY TIED IN PLACE PRIOR TO POURING OF CONCRETE OR GROUT.
- ANCHOR BOLTS WITH UPSET THREADS SHALL NOT BE USED.
- NO PIPES, DUCTS, OR CONDUIT SHALL BE PLACED IN CONCRETE UNLESS SPECIFICALLY OUTLINED OR NOTED.
- DAUGHEN AND CLEAN CONSTRUCTION JOINTS PER ACI 308-14 265.6. THE CONSTRUCTION JOINT NEEDS TO BE FREE OF LAITANCE AND ROUGHENED TO A FULL AMPLITUDE OF 1/4". THE JOINT SHOULD ALSO BE SATURATED BEFORE PLACEMENT OF NEW CONCRETE. NO STANDING WATER IS ALLOWED BETWEEN NEW CONCRETE AND THE EXISTING CONCRETE.

PROOF LOAD TESTS FOR EXPANSION TYPE ANCHOR BOLTS

- ANCHOR DIAMETER REFERS TO THE TREAD SIZE FOR THE WEDGE & SHELL CATEGORIES, AND TO THE ANCHOR OUTSIDE DIAMETER FOR THE SLEEVE CATEGORY.
- APPLY PROOF TEST LOADS TO WEDGE & SLEEVE ANCHORS WITHOUT REMOVING THE NUT IF POSSIBLE. IF NOT, REMOVE NUT AND INSTALL A TREADED COUPLER TO THE SAME TIGHTNESS AS THE ORIGINAL NUT USING A TORQUE WRENCH TO APPLY THE TEST LOAD.
- FOR SLEEVE/SHELL, INTERNALLY THREADED CATEGORIES, VERIFY THAT THE ANCHOR IS NOT PREVENTED FROM WITHDRAWING BY A BASEPLATE OR OTHER FIXTURES. IF RESTRAINT IS FOUND, LOOSEN OR SHIM OR REMOVE FIXTURES PRIOR TO TESTING.
- REACTION LOADS FROM TEST FIXTURES MAY BE APPLIED CLOSE TO THE ANCHOR, BEING TESTED, PROVIDED THE ANCHOR IS NOT RESTRAINED FROM WITHDRAWING BY THE FIXTURE(S).
- SHELL TYPE ANCHOR SHOULD BE TESTED AS FOLLOWS:
 - VISUALLY INSPECT 25% FOR FULL EXPANSION AS EVIDENCE BY THE LOCATION OF THE EXPANSION PLUGS IN THE ANCHOR BODY. PLUS LOCATION OF A FULLY EXPANDED ANCHOR SHOULD BE AS RECOMMENDED BY THE MANUFACTURER, OR, IN THE ABSENCE OF SUCH RECOMMENDATION, AS DETERMINED ON THE JOB SITE FOLLOWING THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. AT LEAST 5% OF THE ANCHORS SHALL BE PROOF LOADED AS INDICATED IN THE TABLE BELOW, BUT NOT LESS THAN THREE ANCHORS PER DAY FOR EACH DIFFERENT PERSON OR CREW INSTALLING ANCHORS, OR:
B. TEST INSTALLED ANCHORS PER SECTION 1104A
- TEST EQUIPMENT (INCLUDING TORQUE WRENCHES) IS TO BE CALIBRATED BY AN APPROVED TESTING LABORATORY IN ACCORDANCE WITH STANDARD RECOGNIZED PROCEDURES.
- ALTERNATE TORQUE TEST PROCEDURES AND TEST VALUES FOR SHELL TYPE ANCHOR MAY BE SUBMITTED TO THE ENFORCEMENT AGENCY FOR REVIEW AND APPROVAL ON A CASE-BY-CASE BASIS WHEN TEST PROCEDURES ARE SUBMITTED AND APPROVED BY THE ENFORCEMENT AGENCY.
- THE FOLLOWING CRITERIA APPLY FOR THE ACCEPTANCE OF ANCHORS:
HYDRAULIC RAM METHOD: THE ANCHOR SHOULD HAVE NO OBSERVABLE MOVEMENT AT APPLICABLE TEST LOAD. FOR WEDGE AND SLEEVE TYPE ANCHORS, A PRACTICAL WAY TO DETERMINE OBSERVABLE MOVEMENT IS THAT THE WASHER UNDER THE NUT BECOMES LOOSE.
TORQUE WRENCH METHOD: THE APPLICABLE TEST TORQUE MUST BE REACHED WITHIN THE FOLLOWING LIMITS:
 - WEDGE OR SLEEVE TYPE, ONE HALF (1/2) TURN OF THE NUT.
 - ONE-QUARTER (1/4) TURN OF THE NUT FOR THE 3/8" SLEEVE ANCHOR ONLY.
 - IF THE MANUFACTURER'S RECOMMENDED INSTALLATION TORQUE IS LESS THAN THE TORQUE NOTED IN THE TABLE, THE MANUFACTURER'S RECOMMENDED INSTALLATION TORQUE SHOULD BE USED IN LIEU OF THE TABULATED VALUES.
- TESTING FREQUENCY SHALL BE AS FOLLOWS (1104A.5.3):
 - WHEN POST-INSTALLED ANCHORS ARE USED FOR BILL PLATE BOLTING APPLICATIONS, 10 PERCENTS OF THE ANCHORS SHALL BE TESTED.
 - WHEN POST-INSTALLED ANCHORS ARE USED FOR OTHER STRUCTURAL APPLICATIONS, ALL SUCH ANCHORS SHALL BE TESTED.
 - WHEN POST-INSTALLED ANCHORS ARE USED FOR NONSTRUCTURAL COMPONENTS, SUCH AS EQUIPMENT ANCHORAGE, 50 PERCENT OR ALTERNATE BOLTS IN A GROUP, INCLUDING AT LEAST ONE-HALF THE ANCHORS IN EACH GROUP, SHALL BE TESTED.
- AVOID DAMAGING EXISTING REINFORCING STEEL. CONTRACTOR TO USE NON-DESTRUCTIVE TESTING TO VERIFY LOCATION OF EXISTING REINFORCING STEEL.

EXPANSION ANCHORS TEST VALUES		
CONCRETE		
HLTI KB-T22 (55) (CC-ES ESR-4266)		
ANCHOR	WEDGE	
DIA. (in)	EMBED. (in)	TORQUE (ft-lbs)
1/2"	2 1/2"	40

DESIGN LOADS:

- FLOOR AND ROOF DESIGN LOADS:
- ROOF LIVE LOAD (REDUCIBLE PER SECTION 1601A.11) ----- 20 P.S.F.
 - ROOF DEAD LOAD ----- 10 P.S.F.
- WIND DESIGN DATA:**
- BASIC WIND SPEED ----- 105 M.P.H. (ULTIMATE)
 - RISK CATEGORY ----- III
 - WIND EXPOSURE ----- C
- SEISMIC DESIGN DATA:**
- RISK CATEGORY ----- III
 - SEISMIC IMPORTANCE FACTOR ----- 1.5
 - SOIL CLASS ----- D
 - MAFPPED SPECTRAL RESPONSE ACCELERATIONS (S_w) ----- 1.725
 - MAFPPED SPECTRAL RESPONSE ACCELERATIONS (S_u) ----- 0.640
 - SPECTRAL RESPONSE COEFFICIENTS (S_w) ----- 1.580
 - SPECTRAL RESPONSE COEFFICIENTS (S_u) ----- NULL
 - SEISMIC DESIGN CATEGORY (SDC) ----- D
 - SEISMIC RESPONSE PROCE (F_p) ----- 3.11W (ULTIMATE)
 - RESPONSE MODIFICATION FACTOR (R) ----- 2.00
 - COMPONENT AMPLIFICATION FACTOR (A_p) ----- 2.50
 - SEISMIC DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS
 - ANALYSIS PROCEDURE ----- EQUIVALENT LATERAL FORCE PROCEDURE

GENERAL:

- ALL CONSTRUCTION SHALL COMPLY WITH THE 2019 C.A.C. TITLE 24, PART I, AND 2019 C.B.C. TITLE 24, PART 2, FOR DSA/SS.
- FRAMING CONDITIONS NOT SPECIFICALLY SHOWN OR INDICATED SHALL BE FRAMED SIMILAR TO DETAILS SHOWN FOR THE RESPECTIVE MATERIALS OR CONDITIONS.
- CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS BEFORE STARTING WORK AND REPORT ANY DISCREPANCIES TO THE ARCHITECT.
- WITHOUT EXCLUSION OF ANY REFERENCE IN THE CONSTRUCTION DOCUMENTS TO ANY RULE OR REGULATION, THE STRUCTURAL ENGINEER IS NOT ASSUMING ANY PROVISIONS OF SUPERVISION OF CONSTRUCTION METHODS OR PROCESSES.
- CHANGES TO THE APPROVED DRAWINGS AND SPECIFICATIONS SHALL BE MADE BY A CONSTRUCTION CHANGE DOCUMENT (CCD) APPROVED BY THE DIVISION OF THE STATE ARCHITECT, AS DEFINED IN 2019 C.A.C. TITLE 24, PART I, SECTION 4-358.

MECHANICAL UNIT FRAMING NOTES

- THE DIMENSIONS FOR THE SUPPORT OF THE MECHANICAL UNITS, EXHAUST FANS, CONDENSING UNITS, ETC., AS SHOWN THE STRUCTURAL DRAWINGS, ARE APPROXIMATE. THE GENERAL CONTRACTOR SHALL COORDINATE THE UNIT TYPE & QUANTITY WITH STRUCTURAL DRAWINGS. NOTIFY THE ARCHITECT OF ANY DISCREPANCY PRIOR TO THE STRUCTURAL STEEL SHOP DRAWING PHASE.
- SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO FULLY COORDINATE THE ANGLE SUPPORT FRAME DIMENSIONS (LENGTH AND WIDTH) WHERE THE NEW MECHANICAL UNIT ATTACHES DIRECTLY TO THE ANGLE SUPPORT FRAME. IN ADDITION THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL EXISTING ROOF CONDITIONS AT EACH NEW MECHANICAL UNIT SO AS THE NEW ANGLE SUPPORT FRAME BASE PLATE ATTACHMENTS DO NOT INTERFERE WITH THE EXISTING ROOF RISER. NOTIFY THE MECHANICAL ENGINEER OF ANY DISCREPANCIES PRIOR TO THE STRUCTURAL STEEL SHOP DRAWING PHASE.
- FURTHER COORDINATION OF THE FIELD WELDED ANGLE FRAME SUPPORTING THE UNIT CURB SHALL BE PROVIDED BY THE GENERAL CONTRACTOR. COORDINATION SHALL BE WITH THE ACTUAL MECHANICAL UNIT CURB DIMENSIONS. THE HEIGHT OF THE SUPPORT FRAME SHALL BE COORDINATED WITHIN THE ROOFING CONTRACTOR AND ARCHITECT, PRIOR TO THE SHOP DRAWING PHASE.
- MECHANICAL UNIT SUBSTITUTIONS MAY IMPACT THE ANGLE SUPPORT FRAMING DUE TO UNIT WEIGHT OR SIZE AS SHOWN ON THE MECHANICAL DRAWINGS. ANY COSTS INCURRED FROM ANY SUBSTITUTION MADE BY THE CONTRACTOR WHICH REQUIRES RE-DESIGN OR MODIFICATIONS TO THE CONSTRUCTION DOCUMENTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR MAY WISH TO INQUIRE AS TO THE PROBABLE EXTENT OF THESE COSTS PRIOR TO INTRODUCING A SUBSTITUTION.
- IT SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO COORDINATE AND PROVIDE ALL FLASHING AND ROOFING AS REQUIRED AT ALL MECHANICAL UNIT ROOF ATTACHMENT PENETRATIONS SO AS ROOF WILL BE COMPLETELY SEALED FROM WATER INTRUSION.

STRUCTURAL STEEL:

- STEEL SHAPES SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING A.S.T.M. DESIGNATIONS.
W SHAPES ----- ASTM A-992 GRADE 50
STRUCTURAL SHAPES & PLATES ----- ASTM A-36
PIPE COLUMNS ----- ASTM A-53 GRADE B
STEEL TUBE ----- ASTM A-500 GRADE B
STEEL DECK ----- ASTM A-653 OR A-1063
- STRUCTURAL FASTENERS SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING A.S.T.M. DESIGNATIONS:
HIGH STRENGTH BOLTS ----- ASTM F-3125 GRADE 120
MACHINE BOLTS ----- ASTM A-307 GRADE A
NUTS ----- ASTM A-563
WASHERS ----- ASTM F-436
THREADED RODS ----- ASTM A-36
STEEL HEADED STUD ANCHORS ----- ASTM A-108 GRADE 1010-TO 1020
ANCHOR RODS:
HEADED:
AT STEEL TO CONC./MASONRY ----- ASTM F-1554
AT LUMBER TO CONC./MASONRY ----- ASTM-A307 GRADE A (GALV.)
THREADED & NUTTED:
AT STEEL TO CONC./MASONRY ----- ASTM F-1554
AT LUMBER TO CONC./MASONRY ----- ASTM A-307 GRADE A (GALV.)
- NO STRUCTURAL STEEL SHALL BE FABRICATED OR ERECTED PRIOR TO REVIEW OF SHOP DRAWINGS BY THE STRUCTURAL ENGINEER.
- ALL ERECTION AND FABRICATION SHALL COMPLY WITH THE LATEST EDITION OF THE AISC.
- WELDING SHALL BE PERFORMED ONLY BY CERTIFIED WELDERS. ALL SHOP WELDING SHALL BE DONE IN THE SHOP OF A LOS ANGELES APPROVED FABRICATOR.
- NO FIELD CUTTING OR BURNING OF STRUCTURAL STEEL WILL BE PERMITTED WITHOUT WRITTEN CONSENT OF THE STRUCTURAL ENGINEER.
- WELD FILLER = E70XX
- ALL C.P. AND C.J.P. WELDS TO RECEIVE NON-DESTRUCTIVE WELD TESTING PER DA IR 17-2.
- ALL BOLTS, WASHERS AND NUTS IN CONTACT WITH PRESERVATIVE-TREATED WOOD AND FIRE-RETARDANT-TREATED WOOD IN INTERIOR, EXTERIOR, WET OR DAMP APPLICATIONS SHALL BE HOT DIPPED ZINC-WATER GALVANIZED STEEL PER ASTM A153. ALL OTHER FASTENERS SHALL BE MECHANICALLY DEPOSITED ZINC COATED STEEL PER ASTM A153.

FOUNDATIONS:

- ALL FILL SHALL BE COMPACTED TO A MINIMUM OF 90% IN ACCORDANCE WITH THE SPECIFICATIONS.
- MAXIMUM ALLOWABLE SOIL BEARING PRESSURE: 1500 PSF
- IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE ALL FOOTINGS AND UTILITY LINE RELATIONSHIPS SO THAT THE NEW FOOTINGS DO NOT INTERFERE WITH EXISTING UTILITY LINES.

Architecture
PLLLP

9

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JOB NO. 65-21-04

CONSULTANTS STAMP:



SCHOOL DISTRICT:

BONITA UNIFIED
SCHOOL
DISTRICT

PROJECT:

BONITA H.S.
GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION:  DATE: _____

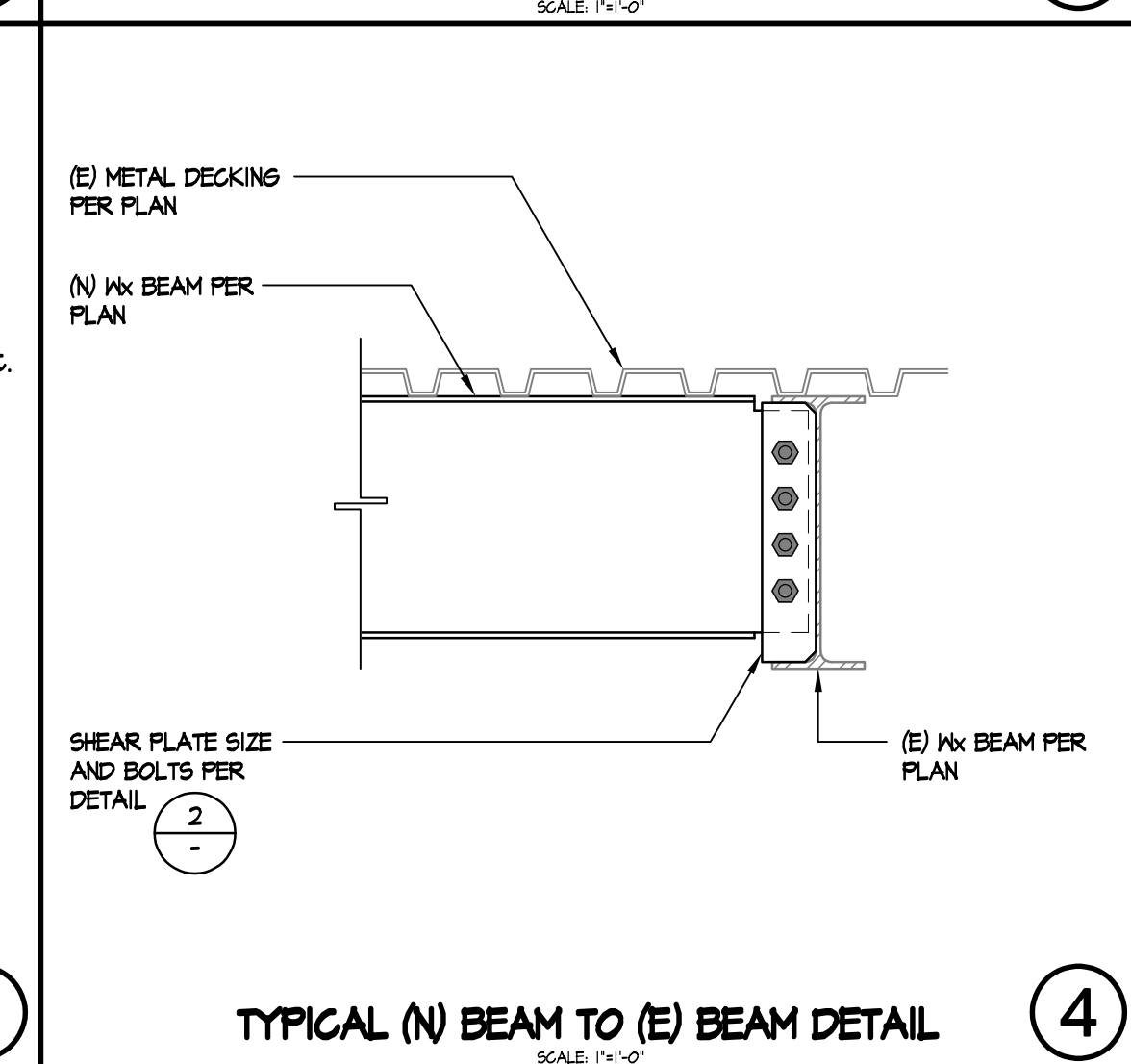
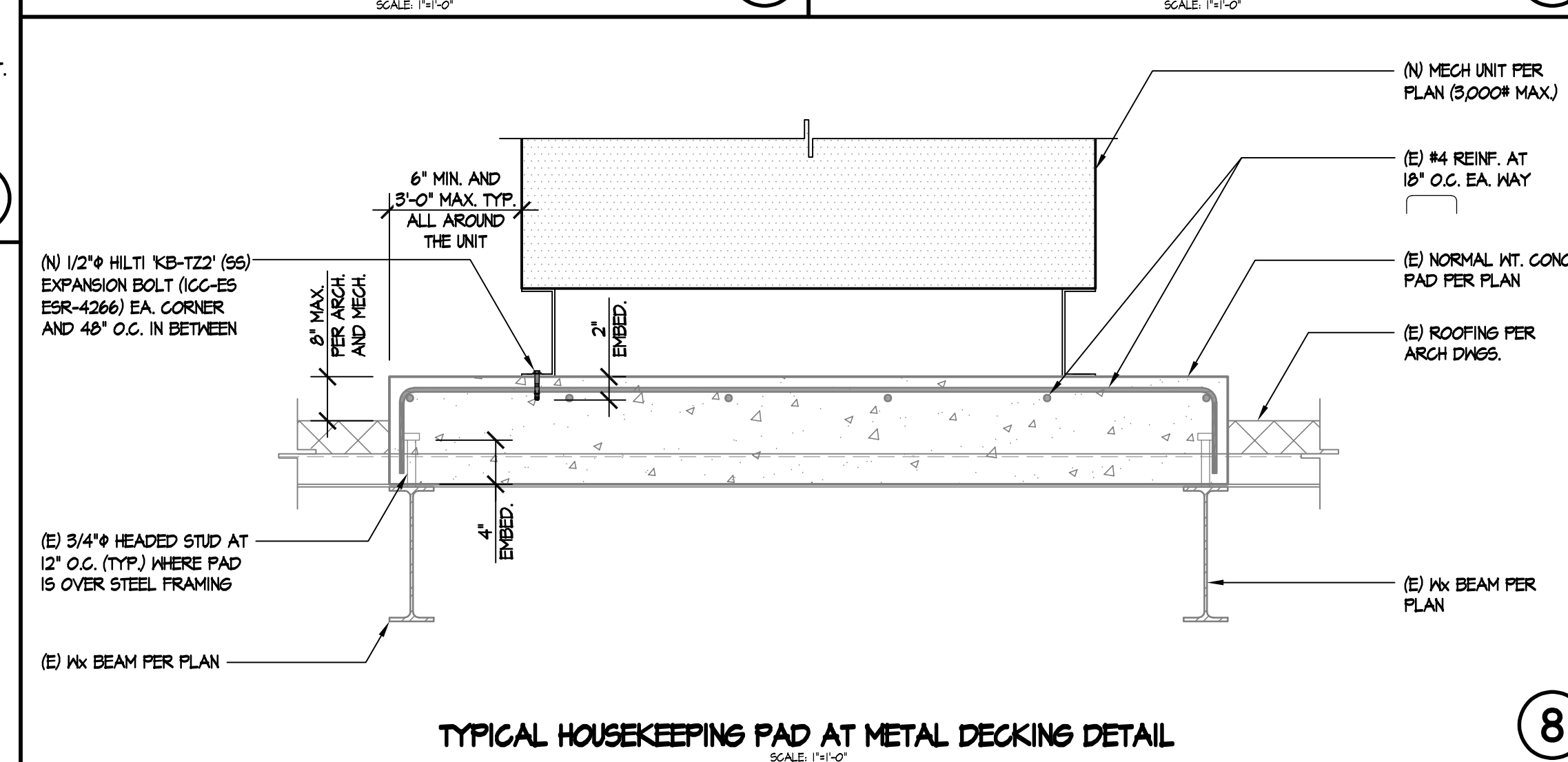
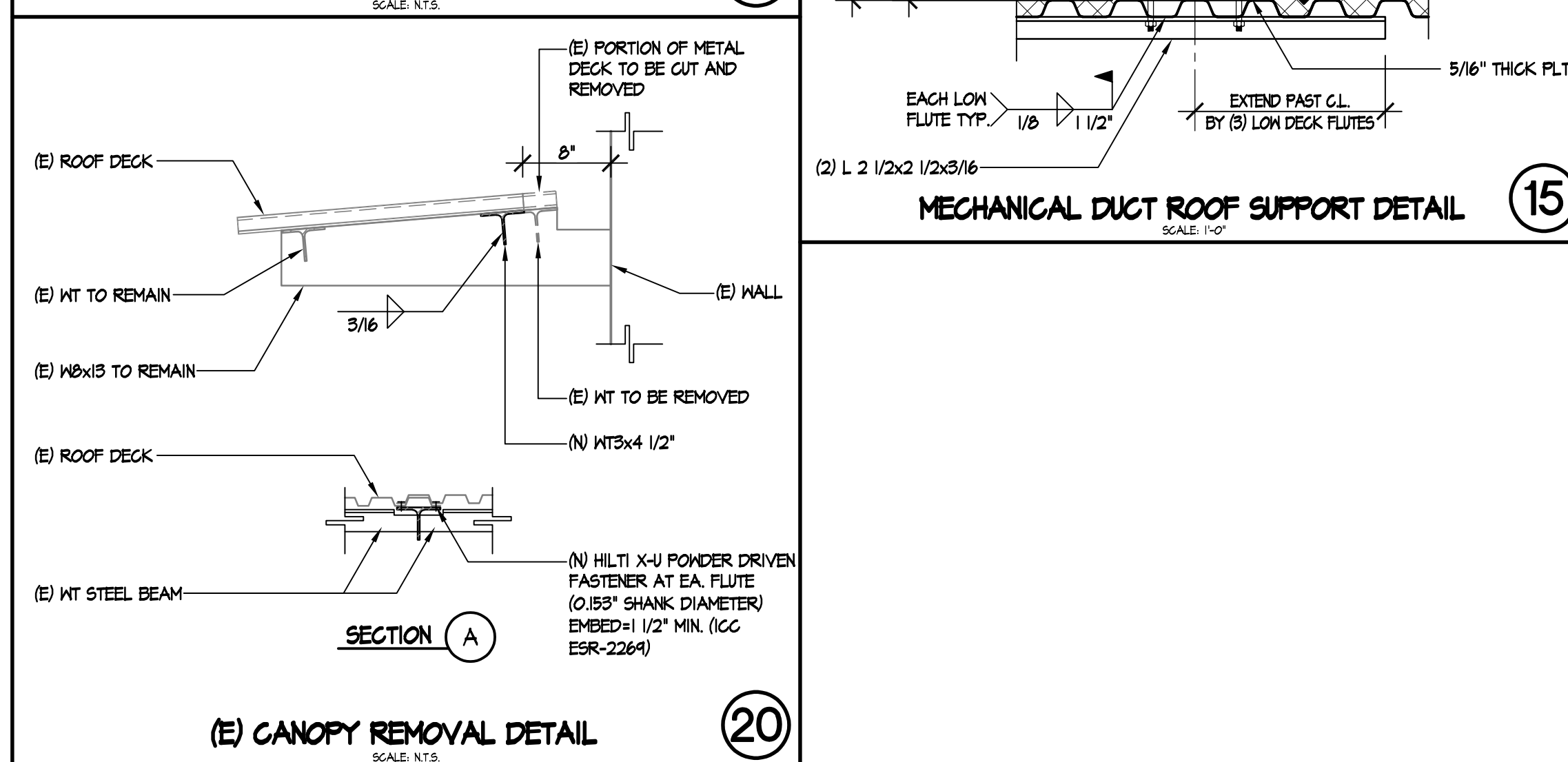
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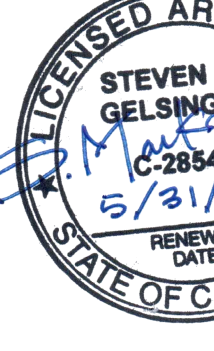

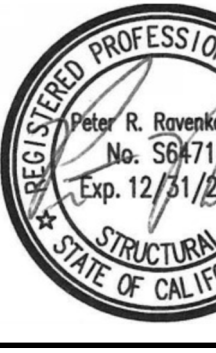


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GENERAL NOTES

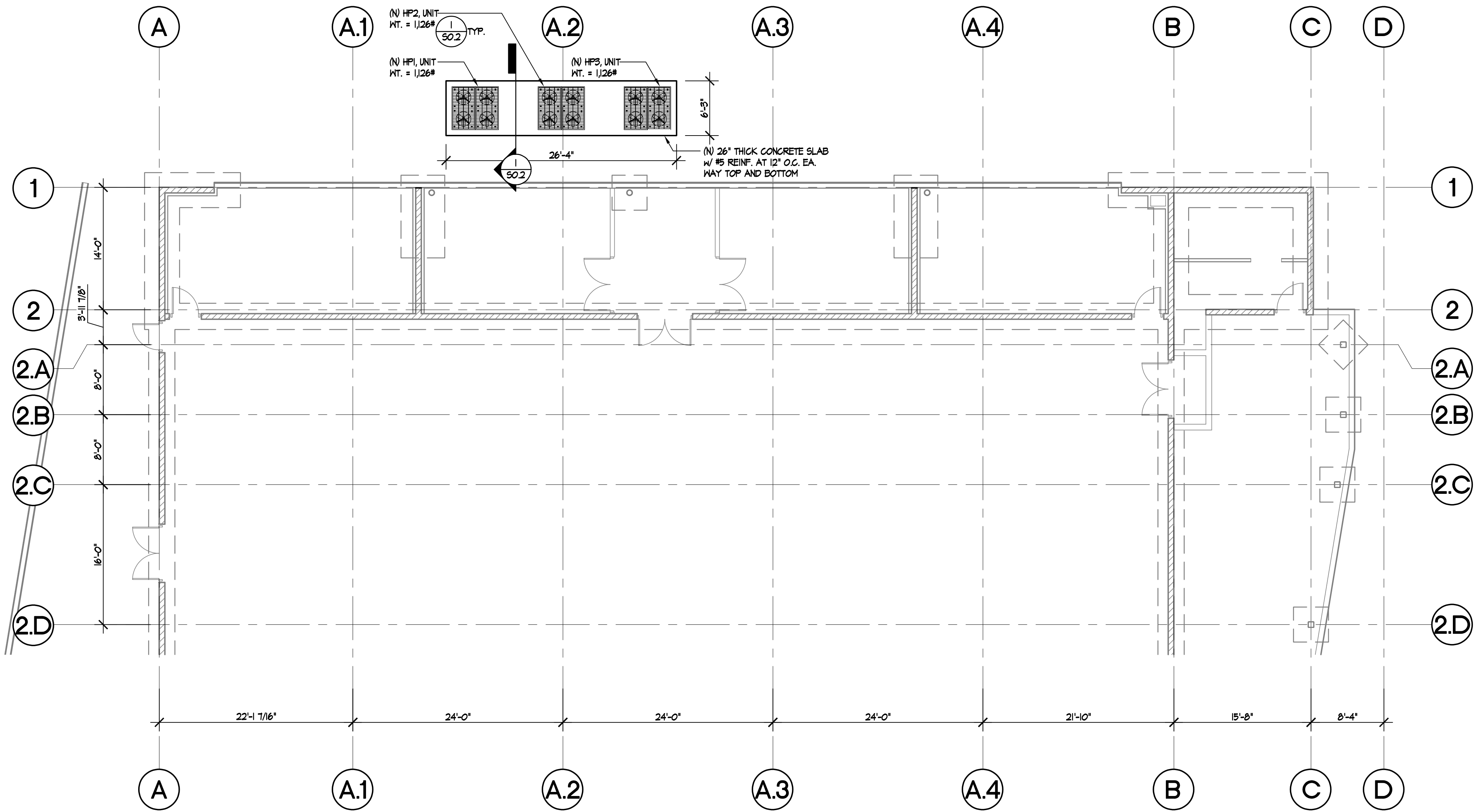
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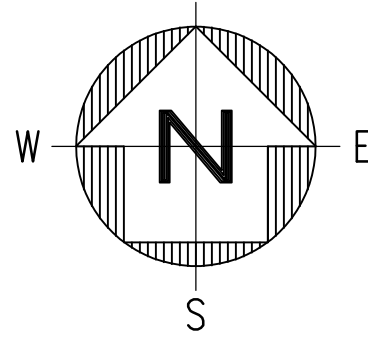


<div style="text-align: center;"> <h1 style="margin: 0;">9</h1> <h2 style="margin: 0;">Architecture</h2> <p style="margin: 0;">PLLLP</p> </div> <p style="font-size: small; margin-top: 20px;">8816 Foothill Boulevard, Suite 103-224 Rancho Cucamonga, CA 91730 a9contact@architecture9.com</p>	
ARCHITECTS STAMP:	
	
CONSULTANT:	
 <p style="font-size: small; margin: 0;">ENGINEERING, INC. CONSULTING STRUCTURAL ENGINEERS 4344 LATHAM ST., SUITE 210 RIVERSIDE, CA 92501-1773 P: 951.684.6200 F: 951.684.6226 JOB NO. <u>65-21-04</u></p>	
CONSULTANTS STAMP:	
	
SCHOOL DISTRICT:	
<h1 style="margin: 0;">BONITA UNIFIED SCHOOL DISTRICT</h1>	
PROJECT:	
<h1 style="margin: 0;">BONITA H.S. GYMNASIUM</h1>	
JOB NUMBER: DATE: 2022-01-14	
REVISION:  DATE: _____ REVISION:  DATE: _____	
DRAWING TITLE:	
<h1 style="margin: 0;">STRUCTURAL DETAILS</h1>	
DRAWING NO.:	
<h1 style="margin: 0;">S0.2</h1>	

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PARTIAL FOUNDATION PLAN
SCALE: 1/8"=1'-0"



FOUNDATION NOTES

1. SEE GENERAL NOTES AND ABBREVIATIONS ON SHEET S0.1.
2. VERIFY ALL DIMENSIONS AND SLAB ELEVATIONS WITH ARCHITECTURAL DRAWINGS.
3. CONTRACTOR SHALL VERIFY IF EXISTING PIPING (PLUMBING, ELECTRICAL, ETC.) OCCURS BELOW NEW MECHANICAL PAD AND IF OCCURS THE PIPING SHALL BE RELOCATED OUTSIDE OF THE NEW MECH. PAD BY A DISTANCE EQUAL TO THE DEPTH OF PIPE BELOW GRADE.

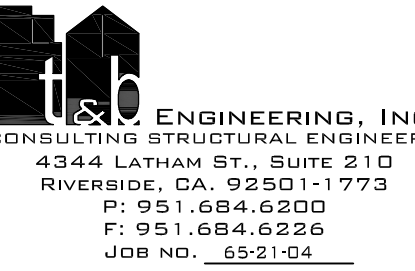


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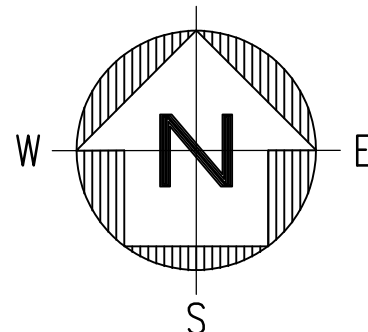
PARTIAL
FOUNDATION
PLAN

DRAWING NO.:

S1.1




SCALE: 1/8"=1'-0"



1. THE FRAMING IN THE VICINITY OF THE MECHANICAL UNITS WAS DESIGNED FOR THE UNIT SIZE AND HEIGHT AS SHOWN ON THE MECHANICAL DRAWINGS. ANY COSTS INCURRED FROM ANY SUBSTITUTION MADE BY THE CONTRACTOR WHICH REQUIRES REDESIGN OR MODIFICATIONS TO THE CONSTRUCTION DOCUMENTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR MAY WISH TO INQUIRE AS TO THE PROBABLE EXTENT OF THE COSTS PRIOR TO INTRODUCING A SUBSTITUTION.
2. (N) PKX BEAM TO (E) PKX BEAM CONNECTION PER DETAIL 4/50.2. (N) PKX BEAM TO (N) PKX BEAM CONNECTION PER DETAIL 2/50.2.
3. (N) H55 BEAM TO (E) PKX BEAM CONNECTION PER 1/50.2.
4. THE SUPPORT OF THE MECHANICAL UNITS, EXHAUST FANS, CONDENSING UNITS, ETC. AS SHOWN ON THE STRUCTURAL DRAWINGS ARE APPROXIMATE. THE GENERAL CONTRACTOR SHALL COORDINATE THE UNIT TYPE AND QUANTITY WITH THE STRUCTURAL DRAWINGS.
5. PROVIDE NEW DECK INFILL PER NOTE 6 WITH INSULATION TO MATCH EXISTING AT LOCATIONS WHERE EXISTING UNITS ARE BEING REMOVED. NEW DECK INFILL PER DETAIL 1/50.2. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR REMAINING INFORMATION. NEW DECK TO MATCH EXISTING DECK ORIENTATION.
6. NEW 1" X 12" JOIST, 20GA. VERCO H55-36 GALV. STL. DECK W/ 1/2" DIA. EFFECTIVE RIDGE ELD AT 12" O.C. AT ALL SPERITS PARALLEL TO CORRUGATIONS AND 1/2" DIA. EFFECTIVE RIDGE WELD AT EACH LONG CORRUGATION PERPENDICULAR TO SUPPORTS. 1 1/2" TOP SUE WELDS AT 12" O.C.

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Professional Engineer Seal for Steven M. Gelsinger, State of California, License C-28546, Renewal Date 5/31/28.



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REVISION:  DATE: _____

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PARTIAL LOW ROOF FRAMING PLAN

S2.1

P:\P-2021\2021-190-00 BUSD Bonita HS-Cym HVAC Upgrade\10_BIM-CAD\MEP\M0.1.dwg 9/19/2022 5:54 PM Charles Cruz

GENERAL NOTES		GENERAL PLAN NOTES		MECHANICAL LEGEND		SHEET INDEX	
<div>1. ALL INDICATED DIMENSIONS ARE APPROXIMATE AND ARE GIVEN FOR ESTIMATE PURPOSES ONLY. BEFORE PROCEEDING WITH THE WORK, THIS CONTRACTOR SHALL CAREFULLY CHECK AND VERIFY ALL DIMENSIONS, SIZES, REQUIRED CLEARANCES, AND SHALL ASSUME FULL RESPONSIBILITY FOR THE FITTING OF ALL EQUIPMENT AND MATERIALS HEREIN REQUIRED TO OTHER PARTS OF THE WORK AND TO THE WORK OF OTHER TRADES.</div> <div>2. CONTRACTOR SHALL COMPLY WITH ALL CONTRACT DOCUMENTS IN LAYING OUT HIS WORK AND EQUIPMENT OR SPECIALTIES REQUIRING READING, ADJUSTMENT, INSPECTION, REPAIRS, REMOVAL OR REPLACEMENT SHALL BE CONVENIENTLY AND ACCESSIBLY LOCATED WITH REFERENCE TO THE FINISHED BLDG.</div> <div>3. DUCT CONSTRUCTION, INSTALLATION & INSULATION SHALL COMPLY WITH 2019 ENERGY CODE, 2019 MECHANICAL CODE, CHAPTER - 6 AND STRUCTURAL DRAWINGS.</div> <div>4. ALL BRACING OF DUCTS AND PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE STRUCTURAL DRAWINGS. WHERE BRACING DETAILS ARE NOT SHOWN ON DRAWINGS OR IN THE GUIDELINES, THE FIELD INSTALLATION SHALL BE TO THE APPROVAL OF THE ARCHITECT, THE STRUCTURAL ENGINEER, THE DSA FIELD ENGINEER, AND THE INSPECTOR OF RECORD.</div> <div>5. ALL FRESH AIR INTAKES SHALL BE LOCATED A MINIMUM OF 10' FROM ANY SANITARY VENT, EXHAUST FAN DISCHARGE AND FLUE OF OTHER FURNACES, WHEN NECESSARY EXTEND VENTS OR PROVIDE ADDITIONAL FRESH AIR INTAKE DUCTWORK AS DIRECTED BY THE ENGINEER.</div> <div>6. FIRE DAMPERS AND SMOKE DAMPERS SHALL BE PROVIDED AS REQUIRED BY SECTION 717 OF THE CALIFORNIA BUILDING CODE. FIRE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS SHALL BE STATE FIRE MARSHAL APPROVED AND INSTALLED STRICTLY IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. MANUFACTURER'S INSTRUCTIONS SHALL BE MADE AVAILABLE TO THE INSPECTING AUTHORITY.</div> <div>7. FIRE DAMPERS OR DOORS SHALL BE PROVIDED WHERE AIR DUCTS PENETRATE FIRE RATED WALLS OR CEILINGS AS REQUIRED BY CBC 717.5.1. DUCTS AND AIR TRANSFER OPENINGS IN FIRE BARRIERS SHALL BE PROTECTED WITH APPROVED FIRE DAMPERS INSTALLED IN ACCORDANCE WITH THEIR LISTING. PROVIDE COMBINATION FIRE/SMOKE DAMPERS AT THE SHAFT PENETRATIONS AS REQUIRED BY CBC 717.5.3.</div> <div>8. WHERE ANCHORAGE DETAILS ARE NOT SHOWN ON THE DRAWINGS, THE FIELD INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE STRUCTURAL ENGINEER, THE DSA FIELD ENGINEER, AND THE INSPECTOR OF RECORD.</div> <div>9. THE SIZES, WEIGHTS AND CAPACITIES OF ALL EQUIPMENT SCHEDULES ON THE DRAWING HAVE BEEN CAREFULLY COMPUTED. SHOULD EQUAL ITEMS BY DIFFERENT MANUFACTURERS BE SUBMITTED FOR APPROVAL, ALL SUCH SUBMITTALS SHALL INCLUDE 1/4 INCH SCALE SHOP DRAWINGS SHOWING METHOD OF INSTALLATION. PROVIDE LOAD RATINGS AND SEISMIC CALCULATIONS AS APPROVED BY A REGISTERED STRUCTURAL ENGINEER WITH EACH SUBMITTAL.</div> <div>10. REQUIRED ROUTINE MAINTENANCE ACTION SHALL BE CLEARLY STATED ON A READILY ACCESSIBLE LABEL, WHICH MAY BE LIMITED TO IDENTIFYING BY TITLE AND/OR PUBLICATION NUMBER THE OPERATION AND MAINTENANCE MANUAL FOR THAT PARTICULAR MODEL AND TYPE OF PRODUCT. ONE COPY OF THIS INFORMATION SHALL BE FURNISHED BY THE CONTRACTOR TO THE OWNER.</div> <div>11. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL TRADES AT THE SITE. ANY COSTS TO INSTALL WORK TO ACCOMPLISH SAID COORDINATION WHICH DIFFERS FROM THE WORK AS SHOWN ON THE PLANS SHALL BE INCURRED BY THE CONTRACTOR. ANY DISCREPANCIES, AMBIGUITIES OR CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT DURING BID TIME FOR CLARIFICATION. ANY SUCH CONFLICTS NOT CLARIFIED PRIOR TO BID SHALL BE SUBJECT TO THE INTERPRETATION OF THE ARCHITECT AT NO ADDITIONAL COST TO THE OWNER.</div> <div>12. AFTER ALL REQUIREMENTS OF THE SPECIFICATIONS AND/OR THE DRAWINGS HAVE BEEN FULLY COMPLETED, REPRESENTATIVES OF THE OWNER WILL INSPECT THE WORK. THE CONTRACTOR SHALL PROVIDE COMPETENT PERSONNEL TO DEMONSTRATE THE OPERATION OF ANY ITEM OR SYSTEM, TO THE FULL SATISFACTION OF EACH REPRESENTATIVE. FINAL ACCEPTANCE OF THE WORK WILL BE MADE BY THE OWNER AFTER RECEIPT OF APPROVAL AND RECOMMENDATION OF ACCEPTANCE FROM EACH REPRESENTATIVE.</div> <div>13. CUTTING, BORING, SAW CUTTING OR DRILLING THROUGH THE NEW STRUCTURAL ELEMENTS IS NOT TO BE STARTED UNTIL THE DETAILS HAVE BEEN REVIEW AND APPROVED BY THE ARCHITECT, STRUCTURAL ENGINEER AND THE FIELD ENGINEER IF THE DETAILS DO NOT SHOW OR CONFORM TO THE APPROVED DRAWINGS.</div> <div>14. WHEREVER A DISCREPANCY IN QUANTITY OR SIZE OF MECHANICAL EQUIPMENT MATERIAL ARISES ON THE DRAWINGS AND/OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIAL AND SERVICES REQUIRED BY THE STRICTEST CONDITIONS NOTED ON DRAWINGS AND/OR IN THE SPECIFICATION TO ENSURE COMPLETE AND OPERABLE SYSTEMS AS REQUIRED BY THE OWNER AND ENGINEER.</div> <div>15. PENETRATIONS OF PIPES, CONDUITS, ETC., IN WALLS REQUIRING PROTECTED OPENING SHALL BE FIRE STOPPED. FIRE STOP MATERIAL SHALL BE A U.L. TESTED AND APPROVED ASSEMBLY APPROVED BY THE STATE FIRE MARSHALL.</div> <div>16. BEFORE BIDDING THE PROJECT THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY THE CLEARANCES AVAILABLE TO BRING THE SPECIFIED EQUIPMENT AND MATERIAL TO THE SITE.</div> <div>17. FINAL LOCATIONS OF THERMOSTAT TO BE VERIFIED WITH THE ELECTRICAL AND MECHANICAL ENGINEER OR THE ARCHITECT AT JOB SITE.</div> <div>18. ALL THERMOSTATS ON EXTERIOR WALLS TO BE MOUNTED ON THERMALLY INSULATED BASE.</div> <div>19. EACH SYSTEM PROVIDING HEATING OR COOLING AIR IN EXCESS OF 2000 CFM IN GROUP A1, 2 & 2.1 GROUP B2 & E OCCUPANCIES SHALL BE EQUIPPED WITH AN AUTOMATIC SHUT-OFF. SHUT-OFFS SHALL STOP THE AIR-MOVING EQUIPMENT WHEN SMOKE IS DETECTED IN MAIN SUPPLY AIR DUCT SERVED BY THE SYSTEM. WHEN THE SYSTEM SERVES MORE THAN ONE OCCUPANCY SHUT-OFFS SHALL BE PROVIDED. EXCEPTIONS: DETECTORS NEED NOT BE INSTALLED WHEN ROOMS HAVE A DIRECT EXIT TO THE EXTERIOR OR WHEN SYSTEMS ARE DESIGNED FOR SMOKE CONTROL (SEC. 608. CMC).</div> <div>20. DUCTS PENETRATING WALLS SHALL BE PROVIDED WITH NECESSARY FRAMES, BRACING AND SMOKE AND ACOUSTICAL SEALANT AROUND THE OPENING.</div> <div>21. CONTACT BETWEEN DISSIMILAR METALS SHALL BE PROTECTED AS DESCRIBED IN THE SPECIFICATIONS, OR AS NEEDED.</div> <div>22. THE INSTALLATION OF VALVES, THERMOMETERS, GAUGES, CLEANOUTS, DAMPERS, DUCT ACCESS DOORS OR OTHER INDICATING EQUIPMENT OR SPECIALTIES REQUIRING READING, ADJUSTMENT, INSPECTION, REPAIRS, REMOVAL OR REPLACEMENT SHALL BE CONVENIENTLY AND ACCESSIBLY LOCATED.</div> <div>23. ALL EQUIPMENT ANCHORAGE, VIBRATION ISOLATION, AND SEISMIC RESTRAINT SYSTEMS FOR ALL EQUIPMENT SHALL BE ENGINEERED, FABRICATED, SUPPLIED AND INSTALLED BY THE APPROPRIATE SUB CONTRACTOR. PROVIDE CALCULATIONS PREPARED BY A LICENSED STRUCTURAL ENGINEER. SUBMIT DETAILS AND CALCULATIONS TO ARCHITECT AND CITY OFFICIALS. THE DEFERRED SUBMITTAL ITEMS SHALL NOT BE INSTALLED UNTIL DESIGN AND SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY THE BUILDING DEPARTMENT.</div> <div>24. PIPING AND DUCT IDENTIFICATION MARKINGS AND COLOR CODES SHALL BE IN ACCORDANCE WITH ANSI A13.1 STANDARDS. MARKING SHALL INCLUDE ARROWS INDICATING DIRECTION OF FLOW. MARKINGS SHALL BE INSTALLED AT A MINIMUM OF EVERY 20' ON STRAIGHT RUNS WHERE THERE ARE NOT VISIBILITY OBSTRUCTIONS. IN AREAS WHERE VISIBILITY OF PIPE OR DUCT IS OBSTRUCTED OR NUMEROUS OTHER PIPES AND DUCTS EXIST, MARKINGS SHALL BE INSTALLED AS APPROVED TO ENABLE PIPES AND DUCTS TO BE EASILY TRACED ALONG ITS ENTIRE PATH. PIPES SHALL BE MARKED AND COLOR-CODED.</div> <div>25. ANY WORK RELATED TO BUILDING AUTOMATION SYSTEM (BAS) SHALL BE PERFORMED BY BAS SUBCONTRACTOR. ALL CONTROL CONDUITS AND WIRING SHALL BE PROVIDED AND INSTALLED BY BAS SUBCONTRACTOR.</div> <div>26. BAS CONTRACTOR TO PERFORM DETAILED COORDINATION BETWEEN ELECTRICAL AND MECHANICAL DRAWINGS FOR SCOPE OF WORK FOR CONDUIT AND POWER REQUIREMENTS. BAS SUBCONTRACTOR SHALL BE RESPONSIBLE FOR SUCH PROVISION AND INSTALLATION. THESE REQUIREMENTS ONLY APPLY TO CONNECTION THAT UTILIZES VOLTAGE OF 120V OR LESS.</div>		<div>MECHANICAL HVAC GENERAL NOTES A. PROVIDE FINAL AIR BALANCE REPORT TO ENGINEERS TO REVIEW AND APPROVAL. B. PROVIDE ALL EXPOSED DUCT WITH 1" INTERNAL LINER. LINED DUCT DIMENSIONS AS SHOWN ON PLANS SHOW INSIDE CLEARANCES. CONTRACTOR TO INCREASE DUCT SIZE AS NEEDED TO PROVIDE INSIDE CLEAR DIMENSIONS SHOWN ON DRAWINGS WHILE PROVIDING REQUIRED LINING AND INSULATION. C. PROVIDE TRANSITIONAL DUCTWORK ON INLET AND OUTLET OF ALL VAV BOXES, FANS, AND OTHER MECHANICAL EQUIPMENTS AS REQUIRED TO CONNECT TO DUCT SIZES SHOWN IN THE PLAN. D. PROVIDE MINIMUM MANUFACTURER'S RECOMMENDED CLEARANCE AROUND MECHANICAL EQUIPMENT, INSTRUMENT, AND CONTROL PANELS FOR INSPECTION AND MAINTENANCE ACCESS. E. PROVIDE MANUAL VOLUME DAMPER ON EACH SUPPLY, RETURN AND EXHAUST DUCT BRANCH WHETHER SHOWN ON THE PLAN OR NOT. F. ANY SQUARE OR ROUND ELBOW ON MAIN SUPPLY AND RETURN AIR DUCT PROVIDE WITH SMOOTH TURNING VANES. G. PROVIDE ACCESS PANEL FOR EQUIPMENT SERVICE AND MAINTENANCE WHERE EQUIPMENTS ARE MOUNTED OVER INACCESSIBLE CEILING. H. PROVIDE ANY SQUARE DUCT MITERED ELBOWS ON SUPPLY OR RETURN DUCT MAINS WITH SMOOTH TURNING VANES. I. INSTALL THERMOSTAT, SENSORS, OR SWITCHES PER MOUNTING DETAIL AS SHOWN ON M-001. J. ANY DUCTWORK, PIPING, AND CONDUITS PASSING THROUGH A SEISMIC JOINT SHALL BE PROVIDED WITH A FLEX CONNECTION AND EXPANSION JOINT. K. COORDINATE WITH GENERAL CONTRACTOR ON FRAMING DUCTWORK THROUGH FULL HEIGHT WALLS. REFER TO THE ARCHITECTURAL SHEETS FOR WALL DETAILS. PROVIDE COMBINATION FIRE SMOKE DAMPERS ON ANY DUCT PASSING THROUGH FIRE RATED WALLS. INTERLOCK CS-FD'S WITH THE FIRE ALARM CONTROL PANEL. L. PROVIDE MINIMUM MANUFACTURER'S RECOMMENDED CLEARANCE IN FRONT OF MECHANICAL EQUIPMENT, INSTRUMENTATION, AND CONTROL PANELS FOR INSPECTION AND MAINTENANCE ACCESS PER EQUIPMENT MAINTENANCE CLEARANCE AND ACCESS REQUIREMENTS. M. WHENEVER POSSIBLE, PROVIDE MECHANICAL EQUIPMENT WITHIN 12" FROM FINISHED T-BAR OR HARD LID CEILING. N. MECHANICAL CONTRACTOR SHALL COORDINATE WITH SOLAR PANEL CONSTRUCTION AND INSTALLATION TEAM FOR ROOF PENETRATION LOCATIONS AND ROOF MOUNTED MECHANICAL DESIGN RELATED COMPONENTS/ELEMENTS. O. ROUND LINED DUCTWORK OR RECTANGULAR LINED DUCTWORK WITH EQUIVALENT PRESSURE DROP/100' ACCEPTABLE BASED ON FIELD VERIFICATION. P. ANY DUCTWORK OR PIPING PENETRATING THROUGH A FIRE RATED WALL, SLAB FLOOR, OR ROOF SHALL BE PROVIDED WITH A COMBINATION FIRE SMOKE DAMPER. ANY PIPING PENETRATING THROUGH A FIRE RATED WALL, SLAB FLOOR, OR ROOF SHALL BE PROVIDED WITH FIRESTOP CAULKING. Q. CONTRACTOR IS RESPONSIBLE FOR PROVIDING IDENTIFICATION FOR HVAC EQUIPMENT, VALVES, AND OTHER APPURTENANCES WHEN CONCEALED IN THE CEILING. SEE GUIDE SPECIFICATION SECTION "22 05 53 - PLUMBING IDENTIFICATION", "23 05 53 - HVAC IDENTIFICATION". R. PROVIDE PIPING IDENTIFICATION PER SPEC SECTION 23 05 53. S. PROVIDE SLEEVE AND SLEEVE SEAL FOR PIPING PASSING THRU NON-FIRE RATED WALLS PER SPEC SECTION 23 07 00. T. PROVIDE FIRE CAULKING AND FIRE STOPPING FOR PIPING PENETRATING THROUGH FIRE RATED WALLS PER SPEC SECTION 23 07 00.</div> <div>MECHANICAL STRUCTURAL COORDINATION GENERAL NOTES A. ALL HVAC EQUIPMENT MODEL NUMBER AND EQUIPMENT WEIGHTS ARE SHOWN ON EQUIPMENT SCHEDULES. UNIT DIMENSIONS SHOWN ON PLANS ARE DIAGRAMMATIC. CONTRACTOR SHALL REFER TO MANUFACTURER'S PRODUCT DATA AND INSTALLATION MANUALS FOR SPECIFIC WEIGHT INCLUDING ACCESSORIES AND CONTROLS. B. MECHANICAL CONTRACTOR SHALL COORDINATE WITH VIBRATION ISOLATORS MANUFACTURER FOR SEISMIC ENGINEERING CALCULATIONS AND EQUIPMENT ATTACHMENTS WITH THE BUILDING STRUCTURE. ALL STRUCTURAL CALCULATIONS AND EQUIPMENT MOUNTING METHODS SHALL BE PRE-ENGINEERED WITH STRUCTURAL ENGINEERS' STAMP APPROVED BY VIBRATION ISOLATORS MANUFACTURE. C. HVAC CONTRACTOR SHALL PROVIDE PRE-ENGINEERED STRUCTURAL CALCULATIONS, REPORTS, AND SHOP DRAWINGS RECEIVED FROM MANUFACTURERS TO BUILDING STRUCTURAL ENGINEER OF RECORD (DESIGN TEAM) FOR REVIEW AND APPROVAL PRIOR TO START OF ANY CONSTRUCTION WORK. D. HVAC CONTRACTOR SHALL COORDINATE WITH VIBRATION ISOLATORS AND SEISMIC MANUFACTURER FOR PROVIDING THEM BUILDING DEFLECTION AND VARIOUS BUILDING IMPORTANCE FACTORS FOR THEIR USE. BUILDING DEFLECTION AND IMPORTANCE FACTORS SHALL BE PRE APPROVED STRUCTURAL DESIGN DOCUMENTS PREPARED BY STRUCTURAL ENGINEER OF RECORD.</div>	<div>SYMBOL </div>	<div>ABBREV. <</div>			

Architecture

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ARCHITECTS STAMP:

CONSULTANT:

CONSULTANTS STAMP:

SCHOOL DISTRICT:

BONITA UNIFIED SCHOOL DISTRICT

PROJECT:

BONITA H.S. GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

GENERAL NOTES, APPLICABLE CODES & SHEET INDEX







DRAWING NO.:

M0.1

AIR HANDLING UNIT (HEAT PUMP) SCHEDULE																																																											
ITEM NO.	MANUFACTURER MODEL NO.	AREA SERVED	LOCATION	EQPT. TYPE	TONS	FAN DATA						COOLING						HEATING						SEER (IEER)	EER	COP @ 47°F	ELECTRICAL DATA					REFRIGERANT		NOISE LEVEL (DBA)	UNIT WEIGHT LBS.	SEISMIC CURB WEIGHT	TOTAL UNIT WEIGHT LBS	DETAIL	REMARKS																				
						AIRFLOW CFM	OA CFM	MIN. DCV OA CFM	EXT. S.P. IN W.G.	QTY.	DRIVE	HP	BHP	FAN RPM	TOTAL MBH	SENS. MBH	EAT °F DB WB	LAT °F DB WB	HEATING STAGE 1		HEATING STAGE 2		KW				V-Ø-HZ	FLA	MCA	MOCP	TYPE	UNIT CHARGE LBS																											
AHU 1	ALLIANCE AHU	GYMNASIUM	LOW ROOF	CUSTOM SPLIT AHU	20.0	8,000	2,960	300	1.5	2	DIRECT	5.0	4.3	3,650	222.4	222.4	83.1 DB 63.7 WB	57.5 DB 54.2 WB	267.0	53.9	84.8	534.0	53.9	114.9	21	21	21	12.8	460-3-60	21.7	23.6	35.0	R-410A	4.28	93.0	2,700	300	3,000	M3.1 M3.3	1 3 4 5 6 7 8 9 10 11 12 13 15 17 19																			
AHU 2	ALLIANCE AHU	GYMNASIUM	LOW ROOF	CUSTOM SPLIT AHU	20.0	8,000	2,960	300	1.5	2	DIRECT	5.0	4.3	3,650	222.4	222.4	83.1 DB 63.7 WB	57.5 DB 54.2 WB	267.0	53.9	84.8	534.0	53.9	114.9	21	21	21	12.8	460-3-60	21.7	23.6	35.0	R-410A	4.28	93.0	2,700	300	3,000	M3.1 M3.3	1 3 4 5 6 7 8 9 10 11 12 13 15 17 19																			
AHU 3	ALLIANCE AHU	GYMNASIUM	LOW ROOF	CUSTOM SPLIT AHU	20.0	8,000	2,960	300	1.5	2	DIRECT	5.0	4.3	3,650	222.4	222.4	83.1 DB 63.7 WB	57.5 DB 54.2 WB	267.0	53.9	84.8	534.0	53.9	114.9	21	21	21	12.8	460-3-60	21.7	23.6	35.0	R-410A	4.28	93.0	2,700	300	3,000	M3.1 M3.3	1 3 4 5 6 7 8 9 10 11 12 13 15 17 19																			
AHU 4	YORK XQE06A4C1AA1	RECEPTION/ OFFICE	LOW ROOF	PACKAGE AHU	5.0	2,000	520	-	0.8	1	BELT	2.9	1.43	1,350	61.9	42.4	80.0 DB 67.0 WB	58.3 DB 56.5 WB	53.0	59.2	83.7	53.0	59.2	83.7	14.5	12.25	3.5	10.1	460-3-60	-	16.8	25.0	R-410A	14.0	78.0	700	350	1,050	M3.1 M3.4	2 3 4 5 6 7 8 9 14 15 18 20																			
REMARKS:																																																											
1 HORIZONTAL SUPPLY/RETURN DISCHARGE UNIT.					6	INTERLOCK UNIT W/ EXISTING LOCAL AREA SMOKE DETECTORS TO SHUT DOWN UPON ALARM. REFER TO FIRE ALARM PLANS FOR LOCATIONS.										9	ECONOMIZER MODE CAPABLE (100% OA).										13	AHU CONTROLLER AND ALL END DEVICES TO BE SENT TO THE FACTORY FOR AHU MANUFACTURER INSTALL. CONTROLS CONTRACTOR TO TEST AND SIGN OFF ON INSTALLATION PRIOR TO UNIT SHIPMENT.										15	DISPLAY TYPE 7-DAY PROGRAMMABLE THERMOSTAT W/ INTEGRATED CO2 SENSOR FOR DEMAND CONTROL VENTILATION OA MODULATION.										18	PROVIDE W/ INTERNAL NEOPRENE VIBRATION ISOLATORS WITH SPRING ISOLATION BASE.									
2 VERTICAL SUPPLY/RETURN DISCHARGE UNIT.					7	NOT USED										10	PROVIDE EATON VFD FOR AHU 1, 2, 3.										14	PROVENT PEDCPRSEN46M POWER EXHAUST W/ OUTSIDE AIR HOOD AND WIRE MESH SCREEN, +200LBS. PROVIDE POWER FROM AHU-4. 460V-3Ø-60, 1.6 FLA. REFER TO DETAIL 6/M3.1.										16	DISPLAY TYPE 7-DAY PROGRAMMABLE THERMOSTAT.										19	ALUMINUM CHASSIS.									
3 COPPER TUBE/ALUMINUM FIN.					8	DISCONNECT PER ELECTRICAL. SEE ELECTRICAL DRAWINGS FOR DETAILS.										11	PROVIDE SEPARATE 120V POWER FOR AHU CONTROLS AND SERVICE LIGHTING.										17	PROVIDE W/ INTERNAL VIBRATION ISOLATORS. PROVIDE WITH RIGID ROOF CURB.										20	INTEGRATED BAROMETRIC RELIEF																				
4 MERV-13 FILTER W/ FILTER DP GAUGE.																12	BLANK-OFF PANEL FOR CUSTOM AHU PLENUM FAN INLET.																					21	FOR EQUIPMENT EFFICIENCIES, REFER TO HEAT PUMP SCHEDULE.																				
5 STAINLESS STEEL CONDENSATE DRAIN PAN																																																											

DX AHU HEAT PUMP UNIT SCHEDULE																					
ITEM NO.	MANUFACTURER MODEL NO.	UNIT SERVED	NOMINAL COOLING /HEATING MBH	FAN QTY.	FAN HP (EACH)	FAN RPM	REFRIGERANT				EER	SEER	COP	ELECTRICAL 7				NOISE LEVEL (dBA)	UNIT WEIGHT LBS.	ANCHOR DETAIL	REMARKS
							TYPE	NO. OF CIRCUITS	PIPE DIA. CONNECTION SIZE RL" Ø RS" Ø	CHARGE (LBS)				COMP. QTY.	RLA	MCA	MOCP	V-Ø-HZ			
HP 1	YORK PD240	AHU-1	240.0/ 220.0	4	3/4	1,100	R410A	2	5/8 1-3/8	69.0	10.6	13.3	3.3	2	39.8	44.0	60.0	406-3-60	73.0	1,126	2 M3.3 1 2 3 4 5
HP 2	YORK PD240	AHU-2	240.0/ 220.0	4	3/4	1,100	R410A	2	5/8 1-3/8	69.0	10.6	13.3	3.3	2	39.8	49.0	60.0	406-3-60	73.0	1,126	2 M3.3 1 2 3 4 5 6
HP 3	YORK PD240	AHU-3	240.0/ 220.0	4	3/4	1,100	R410A	2	5/8 1-3/8	69.0	10.6	13.3	3.3	2	39.8	44.0	60.0	406-3-60	73.0	1,126	2 M3.3 1 2 3 4 5
<div>REMARKS:</div> <div>1 COOLING AND HEATING CAPABLE.</div> <div>2 UNIT MOUNTED DISCONNECT SWITCH PROVIDED BY ELECTRICAL.</div> <div>3 ECM, DIRECT DRIVE FAN, QTY.4</div> <div>4 OPERATING CONDITIONS: -COOLING: 35°F-112°F -HEATING: -5°F-75°F</div> <div>5 LOW AMBIENT KIT</div> <div>6 PROVIDE W/ POWERED CONVENIENCE OUTLET</div> <div>7 ELECTRICAL VALUES ARE THE SUM OF BOTH COMPRESSOR'S REQUIREMENTS.</div>																					

EXISTING EXHAUST FAN SCHEDULE																		
ITEM NO.	MANUFACTURER MODEL NO.	SERVICE AREA	LOCATION	FAN TYPE	DRIVE	MAX AIR FLOW CFM	E.S.P. IN. H2O	EST. FAN RPM	FAN BHP	MOTOR				NOISE LEVEL dBA (SONES)	EST. OPER. WEIGHT LBS.	ANCHOR DETAIL	REMARKS	
										RPM	FLA	HP	V-Ø-HZ					
(E) EF-1	LOREN COOK ACE-B 270C7B	GYMNASIUM RELIEF FAN	GYMNASIUM ROOFTOP	CENTRIFUGAL	BELT	6,750	0.125	564	0.9	1,725	4.2	1.0	230-3-60	62 (11.4)	210	<div><div>2</div><div>M3.4</div></div> <div>123</div>		
(E) EF-2	LOREN COOK ACE-B 270C7B	GYMNASIUM RELIEF FAN	GYMNASIUM ROOFTOP	CENTRIFUGAL	BELT	6,750	0.125	564	0.9	1,725	4.2	1.0	230-3-60	62 (11.4)	210	<div><div>2</div><div>M3.4</div></div> <div>123</div>		
(E) EF-3	LOREN COOK ACE-B 270C7B	GYMNASIUM RELIEF FAN	GYMNASIUM ROOFTOP	CENTRIFUGAL	BELT	6,750	0.125	564	0.9	1,725	4.2	1.0	230-3-60	62 (11.4)	210	<div><div>2</div><div>M3.4</div></div> <div>123</div>		
(E) EF-4	LOREN COOK ACE-B 270C7B	GYMNASIUM RELIEF FAN	GYMNASIUM ROOFTOP	CENTRIFUGAL	BELT	-	-	-	-	-	-	-	-	-	219	<div>-</div> <div>4</div>		
(E) EF-5	LOREN COOK ACE-B 270C7B	GYMNASIUM RELIEF FAN	GYMNASIUM ROOFTOP	CENTRIFUGAL	BELT	-	-	-	-	-	-	-	-	-	219	<div>-</div> <div>4</div>		
(E) EF-6	LOREN COOK ACE-B 270C7B	GYMNASIUM RELIEF FAN	GYMNASIUM ROOFTOP	CENTRIFUGAL	BELT	-	-	-	-	-	-	-	-	-	219	<div>-</div> <div>4</div>		
REMARKS:																		
① EXISTING EXHAUST FAN'S INTERNAL COMPONENTS TO BE REPLACED WITH NEW FAN WHEEL, BELT, SHAFT, BEARING, ETC. TO MEET SCHEDULED PERFORMANCE. OVERALL REDUCTION IN UNIT WEIGHT. REFER TO DETAIL 2/M3.4 FOR BEFORE AND AFTER SUBMITTALS. PROVIDE WITH NEW EQUIPMENT NAMEPLATE FOR UPDATED PERFORMANCE.										② INTERLOCK EXHAUST FAN WITH BAS TO MAINTAIN BUILDING PRESSURIZATION. REFER TO CONTROL DIAGRAMS FOR DETAILS.			③ REESTABLISH EXHAUST FAN POWER CONNECTION VIA SCHEDULED VFD. REFER TO WIRING DIAGRAM 9/M3.2.			④ EXISTING EXHAUST FAN TO BE BLANKED OFF, DISCONNECTED, REMOVED FROM EXISTING BAS SEQUENCE, AND ABANDONED IN PLACE.		

VARIABLE FREQUENCY DRIVE SCHEDULE															
ITEM NO.	MANUFACTURER & MODEL NO.	LOCATION	SYSTEM SERVED	TYPE	HP	INPUT			OUTPUT			FLA	OPER. WEIGHT (LBS)	DETAIL	REMARKS
						VOLT	PHASE	HERTZ	VOLT	PHASE	HERTZ				
	INVERTEK E3 VO1A13N00G	UTILITY ROOM 107	(E) EF-1	UL NEMA 1	1.0	110-115	1	48-62	230	3	60	4.3	5	 7 M3.1	① ② ③
	INVERTEK E3 VO1A13N00G	UTILITY ROOM 107	(E) EF-2	UL NEMA 1	1.0	110-115	1	48-62	230	3	60	4.3	5	 7 M3.1	① ② ③
	INVERTEK E3 VO1A13N00G	UTILITY ROOM 107	(E) EF-3	UL NEMA 1	1.0	110-115	1	48-62	230	3	60	4.3	5	 7 M3.1	① ② ③
<div>REMARKS:</div> <div>① PROVIDE AC LINE REACTORS, SERVICE SWITCH AND ECLIPSE BYPASS. PROVIDE BACNET AND CIRCUIT BREAKER.</div> <div>② MOTOR TIED TO VFD SHALL BE PROVIDED WITH SHAFT GROUNDING DEVICE.</div> <div>③ PROVIDE W/ DISCONNECT UPSTREAM. REFER TO WIRING DETAIL 9/M3.2.</div>															

2019 CALIFORNIA GREEN BUILDING STANDARDS CODE

- UNLESS SPECIFIED OTHERWISE, FOR ALL NEW MECHANICAL SYSTEMS, PROVIDE AIR FILTRATION MEDIA FOR OA AND RA PRIOR TO OCCUPANCY THAT PROVIDES MIN. MERV-13 FILTER.
- 2019 GBC 5.410.4.3 PROCEDURES - PERFORM TESTING AND ADJUSTING PROCEDURES IN ACCORDANCE W/ MANUF'S SPECIFICATIONS AND APPLICABLE STANDARDS ON EACH SYSTEM.
- 2019 GBC 5.410.4.4 REPORTING - AFTER COMPLETION OF TESTING, ADJUSTING AND BALANCING, PROVIDE A FINAL REPORT OF TESTING SIGNED BY THE INDIVIDUAL RESPONSIBLE FOR PERFORMING THESE SERVICES.
- 2019 GBC 5.410.4.3.1 HVAC BALANCING - IN ADDITION TO TESTING AND ADJUSTING,BEFORE A NEW SPACE-CONDITIONING SYSTEM SERVING A BUILDING OR SPACE IS OPERATED FOR NORMAL USE, BALANCE THE SYSTEM IN ACCORDANCE WITH THE PROCEDURES DEFINED BY THE TESTING ADJUSTING AND BALANCING BUREAU NATIONAL STANDARDS;THE NATIONAL ENVIRONMENTAL BALANCING BUREAU PROCEDURAL STANDARDS;ASSOCIATED AIR BALANCE COUNCIL NATIONAL STANDARDS OF AS APPROVED BY THE ENFORCING AGENCY.
- 2019 GBC 5.410.4.5.1 INSPECTIONS AND REPORTS - INCLUDE A COPY OF ALL INSPECTION VERIFICATION AND REPORTS REQUIRED BY THE ENFORCING AGENCY.
- 2019 GBC 5.410.4.2 SYSTEMS - DEVELOP A WRITTEN PLAN OF PROCEDURES FOR TESTING AND ADJUSTING SYSTEMS. SYSTEMS TO BE INCLUDED FOR TESTING AND ADJUSTING SHALL INCLUDE, AS APPLICABLE TO THE PROJECT.

A. HVAC SYSTEMS AND CONTROLS

B. INDOOR AND OUTDOOR LIGHTING AND CONTROLS

C. WATER HEATING SYSTEMS

D. RENEWABLE ENERGY SYSTEMS

E. LANDSCAPE IRRIGATION SYSTEMS

F. WATER REUSE SYSTEMS

• TABB'S CONSTRUCTION SPECIFICATIONS INSTITUTE

• MASTERFORMAT (23 05 99 AND 15990)

• AABC'S NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE (6TH EDITION)

• ASHRAE'S STANDARD 111-2008 (RA 2017)
- 2019 GBC 5.410.4.5 OPERATION AND MAINTENANCE (O & M) MANUAL - PROVIDE THE BUILDING OWNER OR REPRESENTATIVE WITH DETAILED OPERATING AND MAINTENANCE INSTRUCTIONS AND COPIES OF GUARANTIES/ WARRANTIES FOR EACH SYSTEM. O & M INSTRUCTIONS SHALL BE CONSISTENT WITH OSHA REQUIREMENTS IN CCR, TITLE 8, SECTION 5142, AND OTHER RELATED REGULATIONS.
- 2019 GBC 5.505.1 INDOOR MOISTURE CONTROL - BUILDINGS SHALL MEET OR EXCEED THE PROVISIONS OF CALIFORNIA BUILDING CODE, CCR, TITLE 24, PART 2, SECTIONS 1203 AND CHAPTER 14.1.

- 2019 GBC 5.410.4 TESTING AND ADJUSTING - TESTING AND ADJUSTING OF SYSTEMS SHALL BE REQUIRED FOR NEW BUILDINGS LESS THAN 10,000 SQ. FT. OR NEW SYSTEMS SERVING AN ADDITION OR ALTERATION SUBJECT TO SECTION 303.1. SEE PROJECT SPECIFICATION SECTION 23 05 93 "TESTING, ADJUSTING AND BALANCING FOR HVAC" AND SECTION 23 08 00 "COMMISSIONING OF HVAC" FOR DETAILED REQUIREMENTS RELATING TO TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS, AS WELL AS RELATED TEST AND BALANCE PROCEDURES, REPORTING, EQUIPMENT OPERATION AND MAINTENANCE MANUALS, INSPECTIONS AND REPORTS."
- 2019 GBC 5.506.2 CARBON DIOXIDE(CO2)MONITORING - PROVIDE CO2 SENSORS FOR DEMAND CONTROL VENTILATION. SEE PROJECT SPECIFICATION SECTION 23 05 100 "INSTRUMENTATION AND CONTROLS FOR HVAC" AS WELL AS CONTROLS AND WIRING DIAGRAMS ON PLANS FOR DETAILED REQUIREMENTS RELATED TO CARBON DIOXIDE (CO2) MONITORING AND DEMAND CONTROL VENTILATION AND INSTALLED WITH THE REQUIREMENTS OF THE CALIFORNIA ENERGY CODE, CCR, SECTION 121(C).
- 2019 GBC A5.504.1 INDOOR AIR QUALITY (IAQ) DURING CONSTRUCTION - MAINTAIN IAQ AS PROVIDED IN SECTION A5.504.1.1 AND 5.504.1.2.
- A5.504.1.1 TEMPORARY VENTILATION - PROVIDE TEMPORARY VENTILATION DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 121 OF THE CALIFORNIA ENERGY CODE, CCR, TITLE 24, PART 6 AND CHAPTER 4 OF CCR, TITLE 8 AND AS LISTED IN ITEMS 1 AND SECTION 2 A5.504.1.2.
- A5.504.1.2 EMPLOY ADDITIONAL MEASURES AS LISTED IN ITEMS 1 THROUGH 5 IN SECTION A5.504.1.3.
- 5.504.1.3 TEMPORARY VENTILATION - IF THE HVAC SYSTEM IS USED DURING CONSTRUCTION, USE RETURN AIR FILTERS WITH MERV OF 8, BASED ON ASHRAE 52.2-1999, OR AN AVERAGE EFFICIENCY OF 30% BASED ON ASHRAE 52.1-1992. REPLACE ALL FILTERS IMMEDIATELY PRIOR TO OCCUPANCY. APPLIES TO ADDITIONS OR ALTERATIONS.
- 2019 GBC A5.504.2 INDOOR AIR QUALITY (IAQ) POST CONSTRUCTION: FLUSH OUT THE BUILDING PER SECTION A5.504.2 PRIOR TO OCCUPANCY OR IF THE BUILDING IS OCCUPIED.
- A5.504.2.1 - IAQ TESTING: A TESTING ALTERNATIVE MAY BE EMPLOYED AFTER ALL INTERIOR FINISHES HAVE BEEN INSTALLED, USING TESTING PROTOCOLS RECOGNIZED BY THE UNITED STATE ENVIRONMENTAL PROTECTION AGENCY (U.S. EPA) AND IN ACCORDANCE WITH SECTION A5.504.2.1.2. RETEST AS REQUIRED IN SECTION A5.504.2.1.3.
- A5.504.2.1.1 - MAXIMUM LEVELS OF CONTAMINATION: ALLOWABLE LEVELS OF CONTAMINANT CONCENTRATIONS MEASURED BY TESTING SHALL NOT EXCEED THE FOLLOWING:

• CARBON MONOXIDE (CO): 9 PARTS PER MILLION, NOT TO EXCEED OUTDOOR LEVELS BY 2 PPM.

• FORMALDEHYDE: 27 PARTS PER BILLION.

• PARTICULATES (PM10): 50 MICROGRAMS PER CUBIC METER.

• 4-PHENYLCYCLOHEXENE (4-PCH): 6.5 MICROGRAMS PER CUBIC METER, AND

• TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC): 300 MICROGRAMS PER CUBIC METER.
- A5.504.2.1.2 TEST PROTOCOLS: TESTING OF IAQ SHOULD INCLUDE THE ELEMENTS LISTED IN ITEMS 1 THROUGH 4.
- 2019 GBC 5.504.3 COVERING OF DUCT OPENINGS AND PROTECTION OF MECHANICAL EQPT. DURING CONSTRUCTION - AT THE TIME OF ROUGH INSTALLATION AND DURING STORAGE ON THE CONSTRUCTION SITE UNTIL FINAL STARTUP OF THE HEATING, COOLING AND VENTILATING EQUIPMENT, ALL DUCT AND OTHER RELATED DISTRIBUTION COMPONENT OPENINGS SHALL BE COVERED WITH TAPE, PLASTIC, SHEET METAL OR OTHER METHODS ACCEPTABLE TO THE DEPARTMENT TO REDUCE THE AMOUNT OF DUST, WATER AND DEBRIS WHICH MAY ENTER THE SYSTEM.

GENERAL PLAN NOTES

OWNER'S RESPONSIBILITIES

- A. PROVIDE THE OWNER'S PROJECT REQUIREMENT (OPR) DOCUMENTATION TO THE COMMISSIONING AGENT (CXA) AND CONTRACTOR FOR INFORMATION AND USE.

- B. ASSIGN OPERATION AND MAINTENANCE PERSONNEL AND SCHEDULE THEM TO PARTICIPATE IN COMMISSIONING TEAM ACTIVITIES.

- C. PROVIDE THE BOD DOCUMENTATION, PREPARED BY ARCHITECT AND APPROVED BY CLIENT, TO THE CXA AND CONTRACTOR FOR USE IN DEVELOPING THE COMMISSIONING PLAN, SYSTEMS MANUAL, AND OAM TRAINING PLAN.

CONTRACTOR'S RESPONSIBILITIES

- CONTRACTOR SHALL ASSIGN REPRESENTATIVES WITH EXPERTISE AND AUTHORITY TO ACT ON ITS BEHALF AND SHALL SCHEDULE THEM TO PARTICIPATE IN AND PERFORM COMMISSIONING PROCESS ACTIVITIES INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

- A. EVALUATE PERFORMANCE DEFICIENCIES IDENTIFIED IN TEST REPORTS AND, IN COLLABORATION WITH ENTITY RESPONSIBLE FOR SYSTEM AND EQUIPMENT INSTALLATION, RECOMMEND CORRECTIVE ACTION.

- B. COOPERATE W/ CXA FOR RESOLUTION OF ISSUES RECORDED IN THE ISSUES LOG.

- C. ATTEND COMMISSIONING TEAM MEETINGS HELD ON A VARIABLE BASIS.

- D. INTEGRATE AND COORDINATE COMMISSIONING PROCESS ACTIVITIES W/ CONSTRUCTION SCHEDULE.

- E. REVIEW AND ACCEPT CONSTRUCTION CHECKLISTS PROVIDED BY THE CXA.

- F. COMPLETE ELECTRONIC CONSTRUCTION CHECKLISTS AS WORK IS COMPLETED AND PROVIDE TO THE COMMISSIONING AUTHORITY.

- G. REVIEW AND ACCEPT COMMISSIONING PROCESS TEST PROCEDURES PROVIDED BY THE COMMISSIONING AUTHORITY.

- H. COMPLETE COMMISSIONING PROCESS TEST PROCEDURES.

COMMISSIONING TEAM

- A. MEMBERS APPOINTED BY CONTRACTOR(S): INDIVIDUALS, EACH HAVING THE AUTHORITY TO ACT ON BEHALF OF THE ENTITY HE OR SHE REPRESENTS, EXPLICITLY ORGANIZED TO IMPLEMENT THE COMMISSIONING PROCESS THROUGH COORDINATED ACTION. THE COMMISSIONING TEAM SHALL CONSIST OF, BUT NOT BE LIMITED TO, REPRESENTATIVES OF CONTRACTOR, INCLUDING PROJECT SUPERINTENDENT AND SUBCONTRACTORS, INSTALLERS, SUPPLIERS, AND SPECIALISTS DEEMED APPROPRIATE BY THE CXA.

B. MEMBERS APPOINTED BY OWNER:

- B.1. CXA: THE DESIGNATED PERSON, COMPANY, OR ENTITY THAT PLANS, SCHEDULES, AND COORDINATES THE COMMISSIONING TEAM TO IMPLEMENT THE COMMISSIONING PROCESS. OWNER WILL ENGAGE THE CXA UNDER A SEPARATE CONTRACT.

- B.2. REPRESENTATIVES OF THE FACILITY USER AND OPERATION AND MAINTENANCE PERSONNEL.

- B.3. ARCHITECT AND ENGINEERING DESIGN PROFESSIONALS.

CXA'S RESPONSIBILITIES

- A. ORGANIZE AND LEAD THE COMMISSIONING TEAM.

Project Name:	Bonita HS Gym	NRCC-PRF-01-E	Page 1 of 9
Project Address:	3102 D St La Verne 91750	Calculation Date/Time:	15:02, Thu, Feb 24, 2022
Input File Name:	2020-019-00 Bonita HS Gym_3.cibd19x		

A. GENERAL INFORMATION					
1	Project Location (city)	La Verne	8	Standards Version	Compliance2019
2	CA Zip Code	91750	9	Compliance Software (version)	EnergyPro 8.2
3	Climate Zone	9	10	Weather File	LOS-ANGELES-DOWNTOWN_722874_CZ2010.epw
4	Total Conditioned Floor Area in Scope	13,947 ft²	11	Building Orientation (deg)	(E) 64 deg
5	Total Unconditioned Floor Area	0 ft²	12	Permitted Scope of Work	ExistingAlteration
6	Total # of Stories (Habitable Above Grade)	1	13	Building Type(s)	Nonresidential
7	Total # of dwelling units	0	14	Gas Type	NaturalGas

B. PROJECT SUMMARY			
Table Instructions: Table B shows which building components are included in the performance calculation. If indicated as not included, the project must show compliance prescriptively if within permit application.			
Building Components Complying via Performance		Building Components Complying Prescriptively	
Envelope (see Table G)	<input type="checkbox"/> Performance <input checked="" type="checkbox"/> Not Included	Covered Process: Commercial Kitchens	<input type="checkbox"/> Performance <input checked="" type="checkbox"/> Not Included
Mechanical (see Table H)	<input checked="" type="checkbox"/> Performance <input type="checkbox"/> Not Included	Covered Process: Computer Rooms	<input type="checkbox"/> Performance <input checked="" type="checkbox"/> Not Included
Domestic Hot Water (see Table I)	<input checked="" type="checkbox"/> Performance <input type="checkbox"/> Not Included	Covered Process: Laboratory Exhaust	<input type="checkbox"/> Performance <input checked="" type="checkbox"/> Not Included
Lighting (Indoor Conditioned, see Table J)	<input type="checkbox"/> Performance <input checked="" type="checkbox"/> Not Included	Mandatory Measures	
Solar Thermal Water Heating (see Table I)	<input type="checkbox"/> Performance <input checked="" type="checkbox"/> Not Included	Electrical power systems, commissioning, solar ready, elevator and escalator requirements are mandatory and should on the NRCC form listed if applicable (i.e. compliance will not be shown on the NRCC-PRF-E.)	
		Electrical Power Distribution S110.11	NRCC-ELC-E
		Commissioning S120.8	NRCC-CXIR-E
		Solar Ready S110.10	NRCC-SRA-E

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C1. COMPLIANCE RESULTS FOR PERFORMANCE COMPONENTS (Annual TDV Energy Use, kBtu/ft²-yr)			
COMPLIES			
Energy Component	Standard Design (TDV)	Proposed Design (TDV)	Compliance Margin (TDV)¹
Space Heating	0.02	0.04	-0.02
Space Cooling	642.09	902.89	-260.80
Indoor Fans	413.13	123.69	289.44
Heat Rejection	--	--	--
Pumps & Misc.	--	--	--
Domestic Hot Water	7.48	7.48	--
Indoor Lighting	55.37	55.37	--
ENERGY STANDARDS COMPLIANCE TOTAL	1,118.09	1,089.47	28.62 (2.6%)

¹ Notes: The number in parenthesis following the Compliance Margin in column 4, represents the Percent Better than Standard.

C2. RESULTS FOR 'ABOVE CODE' QUALIFICATIONS¹			
<input type="checkbox"/> This project is pursuing CalGreen Tier 1		<input type="checkbox"/> This project is pursuing CalGreen Tier 2	
Miscellaneous Energy Component	Standard Design (TDV)	Proposed Design (TDV)	Compliance Margin (TDV)¹
Receptacle	54.79	54.79	--
Process	3,132.68	3,132.68	--
Other Ltg	--	--	--
Process Motors	--	--	--
COMPLIANCE TOTAL PLUS MISCELLANEOUS COMPONENTS	4,305.56	4,276.94	28.6 (0.7%)

¹ Notes: This table is used to document compliance with programs OTHER THAN Title 24 Part 6, if applicable.

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance Report Version: NRCC-PRF-01-E-12202021-6384 Report Generated at: 2022-02-24 15:04:28

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Input File Name:	2020-019-00 Bonita HS Gym_3.cibd19x		

C3. ENERGY USE SUMMARY						
Energy Component	Standard Design Site (MWh)	Proposed Design Site (MWh)	Margin (MWh)	Standard Design Site (MBtu)	Proposed Design Site (MBtu)	Margin (MBtu)
Space Heating	--	0.0	--	0.2	--	--
Space Cooling	240.6	386.3	-145.7	--	--	--
Indoor Fans	189.9	56.4	133.5	--	--	--
Heat Rejection	--	--	--	--	--	--
Pumps & Misc.	--	--	--	--	--	--
Domestic Hot Water	--	--	--	57.8	57.8	0.0
Indoor Lighting	25.7	25.7	0.0	--	--	--
Compliance Total	456.2	468.4	-12.2	58.0	57.8	0.2
Receptacle	25.4	25.4	0.0	--	--	--
Process	1,493.9	1,493.9	--	--	--	--
Other Ltg	--	--	--	--	--	--
Process Motors	--	--	--	--	--	--
TOTAL	1,975.5	1,987.7	--	58.0	57.8	0.2

D. EXCEPTIONAL CONDITIONS	
The user model includes space(s) that are designed to be served by mechanical cooling systems, but the cooling systems were not included in the simulation model. A cooling system has been modeled for both the proposed and standard cases.	
The user model includes space(s) without sufficient cooling equipment. Cooling equipment has been added to the model to meet cooling loads.	

E. HERS VERIFICATION	
This Section Does Not Apply	

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance Report Version: NRCC-PRF-01-E-12202021-6384 Report Generated at: 2022-02-24 15:04:28

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H1. DRY SYSTEM EQUIPMENT (furnaces, air handling units, heat pumps, VRF, economizers etc.)											
1	2	3	4	5	6	7	8	9	10	11	12
Equipment Name	Equipment Type	Qty	Heating			Cooling			Economizer Type (if present)	Status¹	
			Total Heating Output (kBtu/h)	Supp Heat Output (kBtu/h)	Efficiency Unit	Efficiency	Total Cooling Output (kBtu/h)	Efficiency Unit	Efficiency		
[AHU-1 AHU-2, AHU-3]	SZVAVHP (Packaged3Phase)	3	278	44	COP	3.30	214	EER	10.6	FixedDryBulb	N
AHU-4	SZHP (Packaged3Phase)	1	55	34	HSPF	8.30	59	SEER	14.50 12.25	FixedDryBulb	N

¹ Status: N - New, A - Altered, E - Existing

H2. FAN SYSTEMS SUMMARY¹												
1	2	3	4	5	6	7	8	9	10	11	12	13
Name or Item Tag	System Type	Design OA	Supply Fan			Return Fan			Economizer Type (if present)	Status¹		
	packaged, DOAS, etc.	CFM	CFM	BHP	Watts	Control	CFM	BHP	Watts	Control		
[AHU-1 AHU-2, AHU-3]	SZVAVHP	633	8000	4.300	3582.2	VariableSpeedDrive	NA	NA	NA	NA	FixedDryBulb	N
AHU-4	SZHP	648	2000	1.430	1232.6	ConstantVolume	NA	NA	NA	NA	FixedDryBulb	N

¹ Status: N - New, A - Altered, E - Existing

H3. EXHAUST FAN SUMMARY						
1	2	3	4	5	6	7
System ID	Zone Name	Qty	CFM	Motor BHP	Motor Watts	Total Static Pressure (in H2O)
Court and Bleachers 1013	1-Court and Bleachers 101	1	6,750	1.000	862.0	0.61

H4. Wet System Equipment (boilers, chillers, cooling towers, etc.)											
1	2	3	4	5	6	7	8	9	10	11	12
Name or Item Tag	Equipment Type	Qty	Vol (gal)	Rated Capacity (kBtu/h)	Efficiency	Standby Loss	Pumps				Status¹
							Qty	GPM	HP	VSD (Y/N)	

¹ Status: N - New, A - Altered, E - Existing

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CONSULTANTS STAMP:



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BONITA UNIFIED
SCHOOL
DISTRICT

PROJECT:

BONITA H.S.
GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

T24 COMPLIANCE
FORMS

DRAWING NO.:

M0.3

Project Name:	Bonita HS Gym	NRCC-PRF-01-E	Page 5 of 9
Project Address:	3102 D St La Verne 91750	Calculation Date/Time:	15:02, Thu, Feb 24, 2022
Input File Name:	2020-019-00 Bonita HS Gym_3.cibd19x		

1	2	3	4	5	6
System Name	Optimum Start	Window Interlocks per §140.4(n)	Evaporative Cooling	Heat Recovery	Other Controls
[AHU-1 AHU-2, AHU-3]	No Optimum Start	NA	No Evaporative Cooler	No Heat Recovery	1 Zones With CO2Sensor Vent. Control, No DDC Fixed Drybulb Economizer No Supply Air Temp. Control
AHU-4	No Optimum Start	NA	No Evaporative Cooler	No Heat Recovery	1 Zones With CO2Sensor Vent. Control, No DDC Fixed Drybulb Economizer No Supply Air Temp. Control
Existing Plant1 - SHW	NA	NA	NA	NA	Fixed Temperature Control, No DDC

Notes: This table includes controls related to the performance path only. For projects using the prescriptive path, mandatory and prescriptive controls requirements are documented on the NRCC-MCH-E.

1	2	3	4	5	6	7	8	9
Zone Name	Mechanical Ventilation							DCV or Occupant Sensor Controls, or Both
	Ventilation Function	# hotel rooms	# of people	# of bedrooms	Supply OA CFM	Exhaust CFM	Conditioned Area (sf)	
1-Court and Bleachers 101	Sports/Entertainment - Gym, sports arena (play area)	0	126.51	0	1898	6750	12651	NA
2-Lobby and Display 109	Lodging - Lobbies/pre-function	0	43.20	0	648	0	1296	NA

Multifamily or Hotel/Motel Occupancy? (if "Yes", see DOMESTIC/SERVICE HOT WATER SYSTEM SUMMARY)	No
--	----

Does the Project include Zonal Systems?	Yes
---	-----

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Input File Name:	2020-019-00 Bonita HS Gym_3.cibd19x		

L. DECLARATION OF REQUIRED CERTIFICATES OF INSTALLATION	
<small>Table Instructions: Selections shall be made by Documentation Author to indicate which Certificates of Installation must be submitted for the features to be recognized for compliance. These documents must be retained and provided to the building inspector during construction and can be found online at: https://www.energy.ca.gov/title24/2019standards/2019_compliance_documents/Nonresidential_Documents/NRCI/</small>	
Building Component	Form/Title
Mechanical	NRCI-MCH-01-E - Must be submitted for all buildings
Plumbing	NRCI-PLB-01-E - Must be submitted for all buildings

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Input File Name:	2020-019-00 Bonita HS Gym_3.cibd19x		

H7. ZONAL SYSTEM AND TERMINAL UNIT SUMMARY											
System ID	Zone Name	System Type	Rated Capacity (kBtu/h)		Airflow (cfm)			Fan			
			Heating	Cooling	Design	Min.	Min. Ratio	BHP	Watts	Cycles	ECM Motor
1-Court and Bleachers 101-Trm	1-Court and Bleachers 101	VAV/NoReheatBox	NA	NA	24000	0	0.00	NA	NA	NA	<input type="checkbox"/>
2-Lobby and Display 109-Trm	2-Lobby and Display 109	Uncontrolled	NA	NA	2000	NA	0.00	NA	NA	NA	<input type="checkbox"/>

H8. EVAPORATIVE COOLER SUMMARY											
This Section Does Not Apply											

I1. WATER HEATER EQUIPMENT SUMMARY													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Name	Heater Element Type	Tank Type	Qty	Tank Vol (gal)	Rated Input	Rated Input Unit	Efficiency	Efficiency Unit	Tank Insulation R-value (Int/Ext)	Standby Loss Fraction	Heat Pump Type	1st Hour Rating or Flow Rate (gal)	Tank Location or Ambient Condition
Default Gas 2000 - 20142	Gas	Storage	1	50.00	40	kBtu/h	0.57	EF	NA	NA	NA	NA	NA

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance Report Version: NRCC-PRF-01-E-12202021-6384 Report Generated at: 2022-02-24 15:04:28

Project Name:	Bonita HS Gym	NRCC-PRF-01-E	Page 8 of 9
Project Address:	3102 D St La Verne 91750	Calculation Date/Time:	15:02, Thu, Feb 24, 2022
Input File Name:	2020-019-00 Bonita HS Gym_3.cibd19x		

M. DECLARATION OF REQUIRED CERTIFICATES OF ACCEPTANCE	
<small>Table Instructions: Selections shall be made by Documentation Author to indicate which Certificates of Acceptance must be submitted for the features to be recognized for compliance. These documents must be provided to the building inspector during construction and must be completed through an Acceptance Test Technician Certification Provider (ATTCP). For more information visit: https://www.energy.ca.gov/title24/2019standards/2019_compliance_documents/Nonresidential_Documents/NRCA/</small>	
Building Component	Form/Title
Mechanical	NRCA-MCH-02-A Outdoor Air must be submitted for all newly installed HVAC units. Note: MCH02-A can be performed in conjunction with MCH-07-A Supply Fan VFD Acceptance (if applicable) since testing activities overlap
	NRCA-MCH-03-A Constant Volume Single Zone HVAC
	NRCA-MCH-05-A Air Economizer Controls
	NRCA-MCH-06-A Demand Control Ventilation Systems Acceptance must be submitted for all systems required to employ demand controlled ventilation (refer to §120.1(c)(3) can vary outside ventilation flow rates based on maintaining interior carbon dioxide (CO2) concentration setpoints
	NRCA-MCH-12-A FDD for Packaged Direct Expansion Units

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CONSULTANTS STAMP:



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BONITA UNIFIED
SCHOOL
DISTRICT

PROJECT:

BONITA H.S.
GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

T24 COMPLIANCE
FORMS

DRAWING NO.:

M0.4

Project Name:	Bonita HS Gym	NBCC-PRF-01-E	Page 9 of 9
Project Address:	3102 D St La Verne 91750	Calculation Date/Time:	15:02, Thu, Feb 24, 2022
Input File Name:	2020-019-00 Bonita HS Gym_3.cibd19x		

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: Noe Portilla

Signature: *Noe Portilla, P.E.*

Company: PBS Engineers

Address: 2100 East Route 66, Suite 210

City/State/Zip: Glendora CA 91740

Phone: 626-650-0350

Signature Date: 2022-02-24

CEA/ HERS Certification Identification (if applicable):

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.

2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).

3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 1.4 of the California Code of Regulations.

4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.

5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Envelope Designer Name:

Signature: NOT IN SCOPE

Company: Architecture 9 PLLP

Address: 8116 Foothill Boulevard, Suite 103-224

City/State/Zip: Rancho Cucamonga CA 91730

Phone: (909)204-9733

Date Signed:

Title:

License #:

Responsible Lighting Designer Name:

Signature: NOT IN SCOPE

Company:

Address:

City/State/Zip:

Phone:

Date Signed:

Title:

License #:

Responsible Mechanical Designer Name: Noe Portilla

Signature: *Noe Portilla, P.E.*

Company: PBS Engineers

Address: 2100 E Route 66 Suite 210

City/State/Zip: Glendora California 91740

Phone: 626-650-0350

Date Signed: 2022-02-24

Title:

License #: M29029

CA Building Energy Efficiency Standards- 2019 Nonresidential Compliance

Report Version: NRCC-PRF-01-E-12202021-6384

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BONITA H.S.
GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

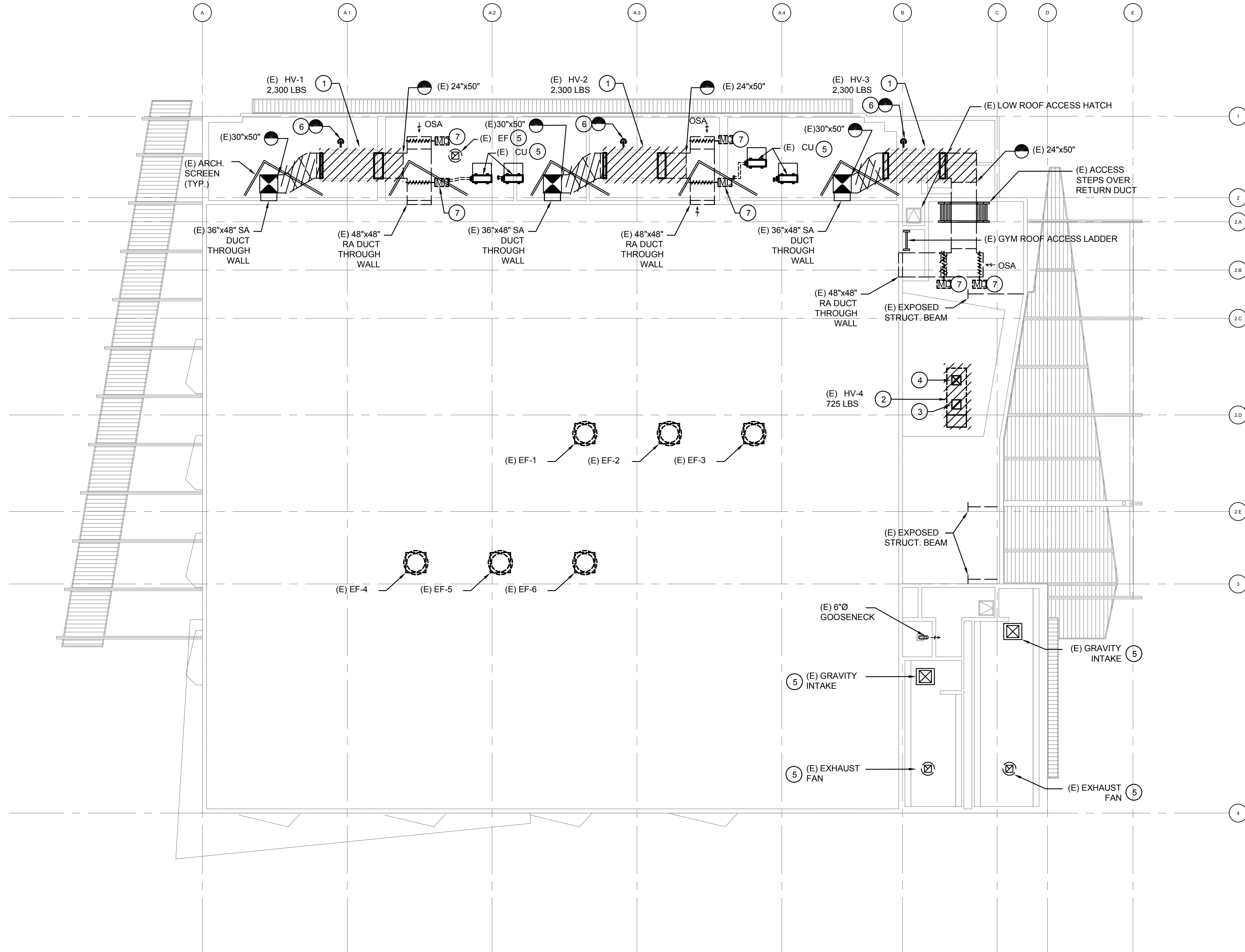
T24 COMPLIANCE
FORMS

DRAWING NO.:

M0.5

M2.1

P:\P-2021\2021-190-00 BUSD Bonita HS-Cym HVAC Upgrade\10_BIM-CAD\MEP\M2.2.dwg 9/19/2022 5:55 PM Charles Cruz



SCALE:
3/32"=1'-0"

1

GENERAL NOTES

1. REFER TO COVER SHEET FOR GENERAL NOTES.

DEMO KEY NOTES

- 1 EXISTING HORIZONTAL DISCHARGE HEATING AND VENTILATING SYSTEM TO BE DEMOLISHED. EXISTING SUPPLY AND RETURN DUCTWORK TO BE REMOVED TO MAKE SPACE FOR NEW AIR HANDLING UNIT. EXISTING ASSOCIATED ELECTRICAL DISCONNECT TO BE REMOVED. EXISTING GAS CONNECTION TO BE DISCONNECTED AND CAPPED ABOVE THE ROOF LEVEL. EXISTING CONTROL CONDUIT TO BE REUSED FOR NEW AIR HANDLING UNIT. EXISTING EQUIPMENT PAD TO BE RE-USED FOR NEW AIR HANDLING UNIT.
- 2 EXISTING VERTICAL DISCHARGE HEATING AND VENTILATING UNIT, EQUIPMENT CURB, GAS CONNECTION, ELECTRICAL DISCONNECT AND CONTROLS WIRING TO BE DEMOLISHED.
- 3 EXISTING RETURN DUCT PENETRATION DOWN THROUGH ROOF TO BE RE-USED.
- 4 EXISTING SUPPLY DUCT PENETRATION DOWN THROUGH ROOF TO BE PATCHED AND FINISHED TO MATCH SURROUNDING AREA PER DETAILS 19/SO.2 & 3/A1.4.
- 5 EXISTING MECHANICAL EQUIPMENT TO REMAIN.
- 6 DISCONNECT EXISTING GAS PIPE AND CAP BELOW ROOF.
- 7 REMOVE EXISTING OUTSIDE AIR/RETURN AIR MOTORIZED DAMPER AND ACTUATOR TO BE REPLACED.

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GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

MECHANICAL
DEMOLITION
ROOF PLAN

DRAWING NO.:

M2.2

MECHANICAL DEMO ROOF PLAN

M2.3



1

MECHANICAL REMODEL ROOF PLAN

PROJECT:
DATE: 9/19/2022

EQUIPMENT WEIGHT: 5 LB

Variable Frequency Drive
Micro Drive
Invertex E3 Series

SPECIFICATIONS:

Input Range: 110-115-120V VAC Single / 48-60Hz
Output Ratings: Output Power 230V Three Phase 1.2-1.1/2 HP
Overload Capacity 100% Overload for 60 sec.
Output Frequency 0-50Hz, 1Hz resolution
Operating Temperature -20 to 50°C
Altitude up to 2000m maximum UL approved
Above 1000m derate to 1% per 100m

Environment:
Pollution: Class II
Control Specifications: Full in frequency
Control Method: Single phase V/F with starting
load
Motor Frequency 4-32Hz Effective
Stopping Mode: Ramp to stop adjustable, 1 to 600 seconds
Coast to stop
Motor Run Warning
Run Frequency single point user adjustable
Stopper Control
MODBUS RTU, Modbus DP, DeviceNet, Ethernet
Power Supply 24 Volt DC, 500mA
24 Volt DC, Sink for programming
Programmable Inputs: 4 Total, 2 Digital, 2 D/A selectable
Programmable Outputs: 2 Total, 1 D/A selectable, 1 relay
Relay Output: Maximum 30V/6A AC, 30V/5A DC
Analog Output: 0 to 10 Volt
Analog PID control with feedback
UL, cUL

Size VFD1418055 shown.

(E) 6"x18" GA. MIN. STUD WALL.

(2) #12 S.M.S. TOP AND BOTTOM.
(TYP.2)

(N) 6"x18" GA. BLK'G W/
(3) #12 S.M.S. EA. STUD

Dimensions (inches)

Item	Qty	Description	HP	Output Amps	H	W	D
EF-1	1	VFD 1.50 HP 110-120V1	1.1/2	8	8-11/16	4-5/16	5-15/16

PLAN VIEW

SIDE VIEW

1 18Vx60H Access Door
2 50Vx30H Damper
3 SPP
4 2in. Prefilter w/ 4in. Final Filters
5 18Vx60H Access Door
6 38Vx 31.5H Cooling Coil(s)
7 24Vx60H Access Door
8 VFD enc.
9 Fan & Motor Assy.
10 50Vx24H Plain Opening

SCFM: 8000
Weight (aluminum): 2700 Lbs.

2385 Michael Faraday Dr. Ste. 13
San Diego, CA 92114
Phone (619) 426-4688
Fax (619) 426-9689

Project: Bonita HS Gym
Unit: AHU-1, 2, 3

PROJECT ENGINEER, M.S.
PE/STP ENGINEER
DATE: 07/25/2022 SCALE: 3/8"=1'-0"
P.L.B.

CONT. HINGE

DUCT

TERMINATION POINT
OF INSULATION

CAM
LATCH

"POTTERFF" ACCESS DOOR
60"-HAD - MAX. SIZE 24"x24"

INSULATED ACCESS PANEL

NOTES:
REFER TO DETAIL 3/M3.3 FOR
ACCESS PANEL CUTSHEET.

NOTES:
ALL ACCESS DOORS TO BE MIN. 12"x12" OR AS APPROVED

VARIABLE FREQUENCY DRIVE CUTSHEET

NOT TO SCALE

7

CUSTOM AHU-1,2,3

NOT TO SCALE

4

DUCT ACCESS PANEL DETAIL

NOT TO SCALE

1

12" LONG FLEXIBLE RUBBER
HOSE, SECURE BOTH ENDS
WITH HOSE CLAMPS

UNION
TYPICAL

PLUG
CLEANOUT

A.C. UNIT
SEE MECHANICAL
DRAWINGS

TRAP

3" MIN. COORDINATE DEPTH
REQUIRED W/C. UNIT
MANUFACTURER

1" CONDENSATE DOWN
THROUGH ROOF FOR
CONT. SEE FLOOR PLAN

SEAL FLASH AND COUNTER
FLASH ROOF PENETRATION
WATER TIGHT-TYP.

ROOF

NOTES:
REFER TO DETAIL 14/M0.2 FOR
ATTACHMENT TO STRUCTURE DETAIL.

1/2" DIA ROD @ 8'-0" O.C. W/ P1000 STIFFENER AND BOLT @ 18" O.C.
BRACING LENGTH 10'-0" MAX

4) Brace
Fittings

6) Rod Stiffeners

3) Brace
Member

1) Duct Connection
(Typ.)

5) UNISTRUT
P1354AW

UNISTRUT 12'-0" MAX
P1000 76 LB MAX.
P1001 280 LB MAX.
P5000 56 LB MAX.
P5001 562 LB MAX.

FILTER DRIER
(TYP. FOR
CRAC UNITS)

MOISTURE INDICATOR (TYP. FOR CRAC UNITS)
(SIGHT GLASS)

TRAP ON SUCTION PIPE EVERY 25
FT MINIMUM MINIMUM 3 PLACES
REQUIRED

SERVICE VALVES
USE 2 ELBOWS (MINIMUM)
CONNECTION TO OUTDOOR UNIT (TYP.)

TO & FROM
HEAT PUMP

SHUT-OFF
VALVE (TYP.)

REFLEXIBLE CONN.(TYP.)

FOR CONDENSATE
DESIGN,
REFER TO
PLUMBING
DRAWINGS.

TERMOSTATIC
EXPANSION VALVE

REFERENCE NOTES:
1 FAN COIL UNITS SHALL BE LOCATED SUCH THAT UNIT CAN BE SERVICED
AND REMOVED WITHOUT REMOVAL OF PERMANENT CONSTRUCTION.
2 INSULATE BOTH REFRIGERANT PIPES.
3 INSTALL PIPES IN STUD WALL WITH TRISOLATOR PIPE SUPPORT.
4 PROVIDE FLEXIBLE CONNECTION FOR REFRIGERANT PIPES AT LIQUID
AND SUCTION LINES AT CONDENSING UNITS & FAN COIL UNITS.
FLEXIBLE CONNECTIONS SHALL BE PACK LESS BRONZE WIRE
BRAIDED (W/ 12" LONG MIN.) AVAILABLE FROM RECTORSEAL NOKINK
FLEXIBLE REFRIGERANT LINE CONNECTOR.
5 12" LONG COPPER BRAIDED FLEXIBLE PIPE CONNECTIONS.
6 INSTALL AND SIZE REFRIGERANT PIPING PER MFR. RECOMMENDATIONS. APPLY LONG
LINE APPLICATION DATA IF VERTICAL LINES ARE ABOVE 50 FT.
7 PROVIDE 1 3/16" THICK NEOPRENE PAD AT EACH SIDE OF THE CONDENSING UNIT.
8 FIELD INSTALLED MUFFLER

CONDENSATE DRAIN TO AC UNIT (ROOF)

NOT TO SCALE

8

DUCT SUPPORT DETAIL

NOT TO SCALE

5

REFRIGERANT PIPING CONNECTION DETAIL

NOT TO SCALE

2

MANUAL CONTROL

DUCT

MANUAL CONTROL

ROUND DUCT

STIFFEN BLADE
AS REQUIRED

INSULATION SEE
SPECIFICATION

DUCT

INSULATION
STAND-OFF

DAMPER BLADE

HANDLE WITH
LOCKING
QUADRANT

INSIDE END BEARING

OUTSIDE END
BEARING

1/2" SQUARE ROD

1/8" CLEARANCE
ALL AROUND

SIDE ELEVATION

SECTION

RECTANGULAR DUCT

NOTES:

- DELETE INSULATION STAND-OFF
ON DUCTWORK WITHOUT
EXTERIOR INSULATION.
DETAIL SHOWS SINGLE BLADE
DAMPER. DAMPER INSTALLATION
SHALL BE SIMILAR FOR
MULTI-BLADE DAMPERS &
ROUND DAMPERS.
- FOR ROUND DUCTS, PROVIDE
MANUAL DAMPER SLEEVE OR
INTEGRATED MANUAL DAMPER
TEE-WYE BRANCH FITTING.

FEATURES

- Includes fully modulating economizer. (See Form ECO-96 for Economizer Specs)
- CO2 controller standard on economizer. Space or duct mounted CO2 sensor provided as option.
- CO2/MMA - Wall Mount With LED
- CO2/MMA - Duct Mount
- Access for motor, blower, and blower drives.
- Adjustable motor sheave.
- Motor with automatic internal thermal protection.
- Modulating option includes fully programmable (factory set) variable frequency drive controlled by a differential pressure transducer designed to continuously monitor space pressure.

DOWN DISCHARGE CENTRIFUGAL
POWER EXHAUST ECONOMIZER FOR YORK
PRESTIGE UNITS
ZX 04-07, ZY, XY 04-06

VOLTAGE	0.1	0.2	0.3	0.4	FLA Hg	Est. Wt
230V/3PH	2,400 cfm	2,200 cfm	2,000 cfm	1,800 cfm	3.2	168 Lbs. (Includes Economizer)
460V/3PH					1.6	

PLEASE NOTE:
1. Return air duct, dampers, return air grills are specific for each unit.
2. For proper electrical wiring, ProVent power exhaust full load amps must be added to equation.

Outside Air Hood

34 7/16"

8 7/8"

19 5/16"

31 3/16"

ANCHORAGE PER
DETAIL 5/M3.4.

Adjustable Support
Legs (included)

Note:
Please contact ProVent if RTU has
a hinged filter access option.

ProVent P/N

CONSTANT VOLUME	MODULATING
PEDCPRS0806C 208/230V 1PH Selectable Dry Bulb	PEDCPRS0806M 208/230V 1PH Selectable Dry Bulb
PEDCPRS0825C 208/230V 3PH Selectable Dry Bulb	PEDCPRS0825M 208/230V 3PH Selectable Dry Bulb
PEDCPRS0825C 208/230V 3PH Enthalpy	PEDCPRS0825M 208/230V 3PH Enthalpy
PEDCPRS0846C 460V 3PH Selectable Dry Bulb	PEDCPRS0846M 460V 3PH Selectable Dry Bulb
PEDCPRS0846C 460V 3PH Enthalpy	PEDCPRS0846M 460V 3PH Enthalpy

MAX. SPACING FOR FASTENER, ACTUAL
INTERVALS ARE APPROXIMATE.

VELOCITY

DIMENSION

A

B

C

E

0-2500 FPM

3"

12"

4"

18"

2501-6000 FPM

3"

6"

4"

16"

AIR FLOW

THE VELOCITY-RATED SIDE OF
LINER MUST FACE THE AIR FLOW

DUCT SECTION
(TYPICAL 4 FT. OR 5
FT.)

LAPPED AND BUTTED CORNER

SHEET METAL PLENUM

ALL TRANSVERSE EDGES TO BE
COATED WITH ADHESIVE

LINACOUSTIC R-300 DUCT LINER
FOR FAN COIL UNIT ENCLOSURE

ALTERNATE FOLDED
CORNER

HOLD FIRMLY IN PLACE W/MIN.
COMPRESSION OF MATERIAL

1/8"

NOMINAL
INSULATION
THICKNESS

NOTES:
LINER ADHERED TO THE DUCT WITH FULL AREA COVERED OF ADHESIVE. ADHESIVE SHALL CONFORM TO ASTM
C 916.
ALL EXPOSED LEADING EDGES AND TRANSFER JOINTS SHALL BE COATED WITH JOHNS MANVILLE SUPER SEAL
DUCT BUTTER, JOHNS MANVILLE SUPER SEAL EDGE TREATMENT OR AN APPROVED ADHESIVE.
ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH THE NAIMA FIBROUS GLASS DUCT LINER
INSTALLATION STANDARD.
THE PERMACOTE LINACOUSTIC R-300 FOR FAN COIL UNITS ENCLOSURE SHALL BE ADDITIONALLY SECURED WITH
MECHANICAL FASTENERS SPACED PER THE SCHEDULE SHOWN. THE P/N LENGTH SHOULD SUCH AS TO HOLD
THE MATERIAL FIRMLY IN PLACE WITH MIN. COMPRESSION OF THE MATERIAL.

MANUAL BALANCING DAMPER DETAIL

NOT TO SCALE

9

AHU POWER EXHAUST

NOT TO SCALE

6

TYPICAL DUCT LINER INSTALLATION DETAIL

NOT TO SCALE

3

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RENEW
DATE

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EXP. 06-30-2023
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SCHOOL
DISTRICT

PROJECT:

BONITA H.S.
GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

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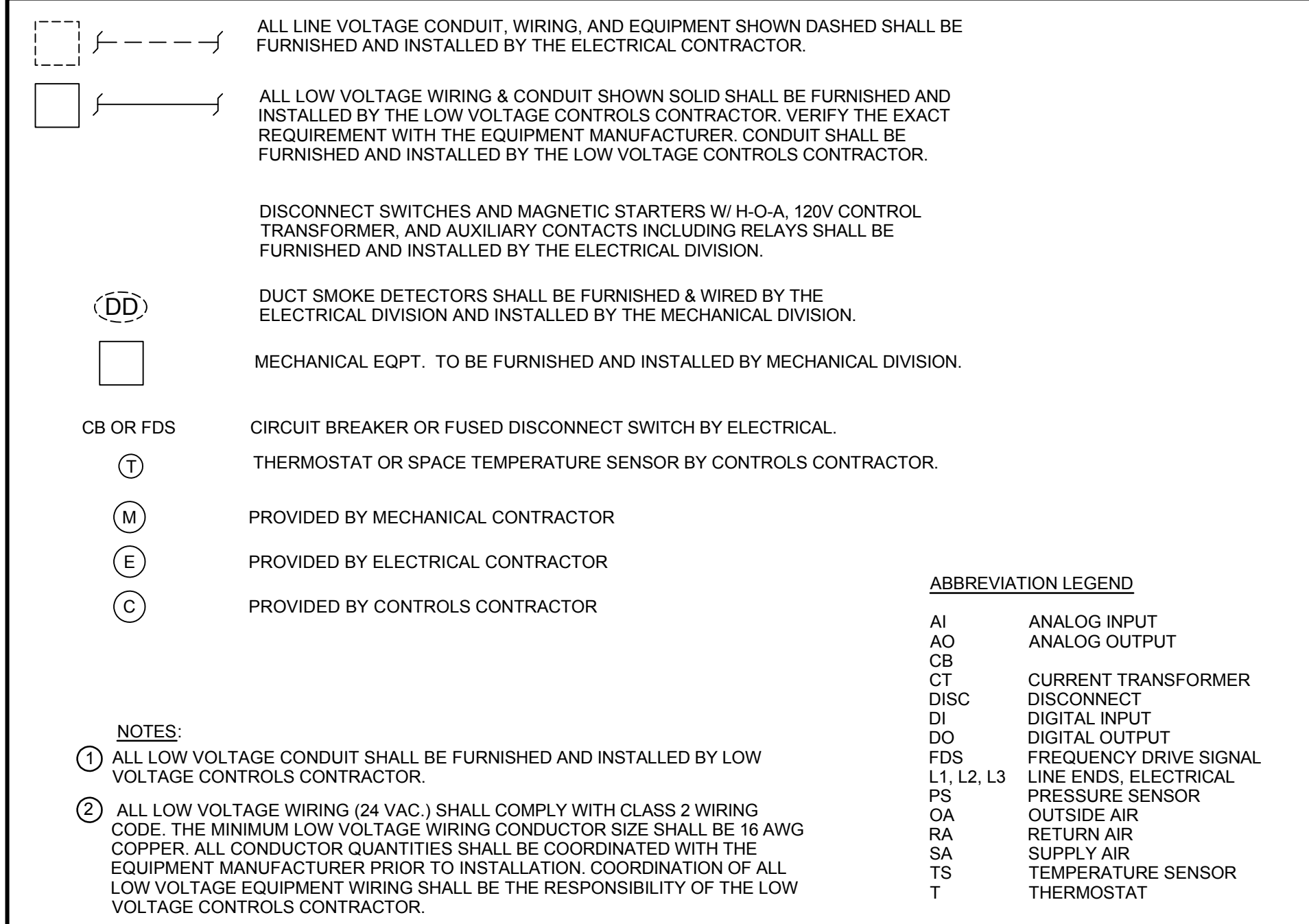
DRAWING TITLE:

MECHANICAL
DETAILS

DRAWING NO.:

M3.1

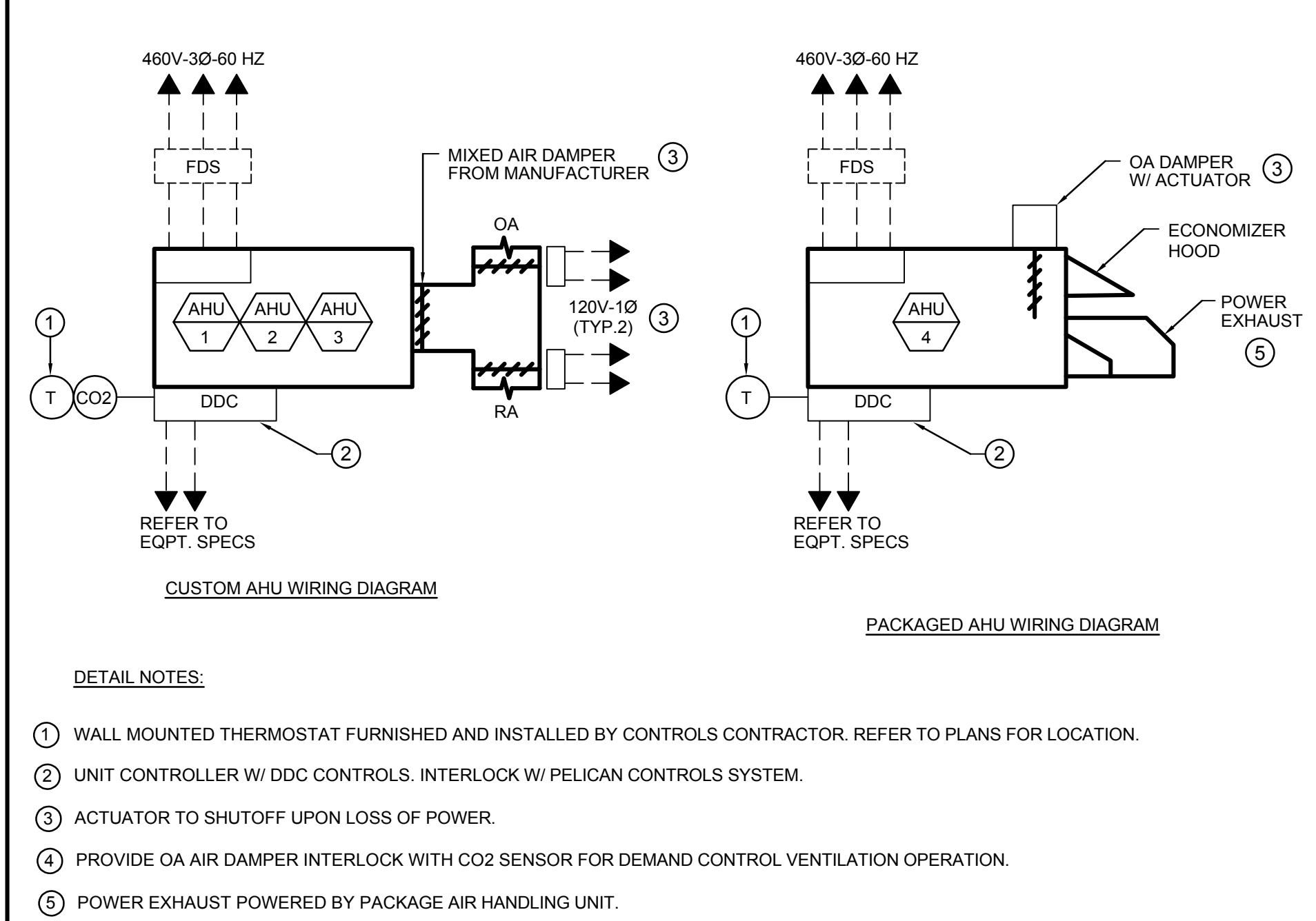
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WIRING LEGEND NOTES

NOT TO SCALE

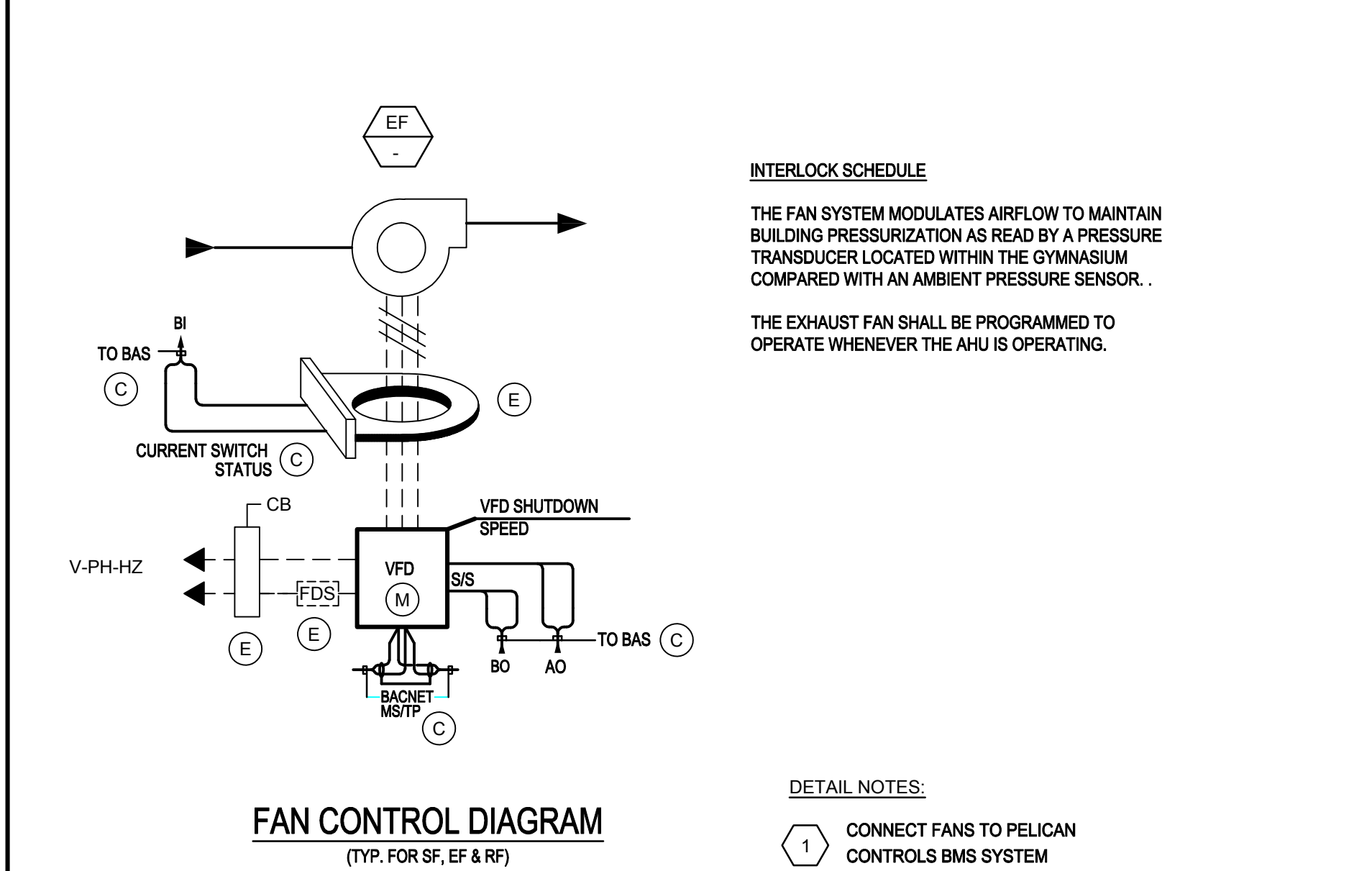
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PACKAGED A/C UNIT WIRING DIAGRAM

NOT TO SCALE

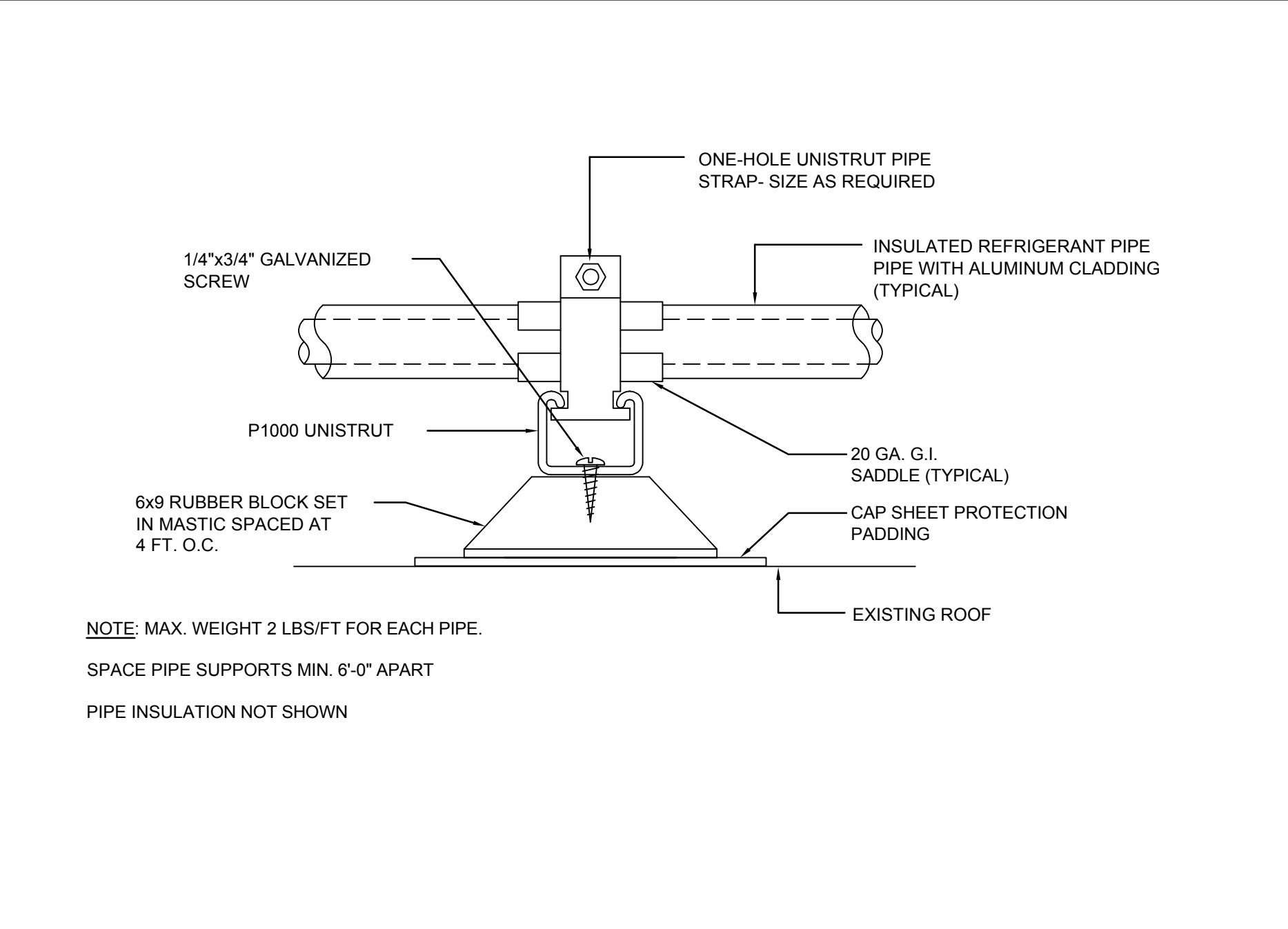
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EXHAUST FAN WIRING DIAGRAM

NOT TO SCALE

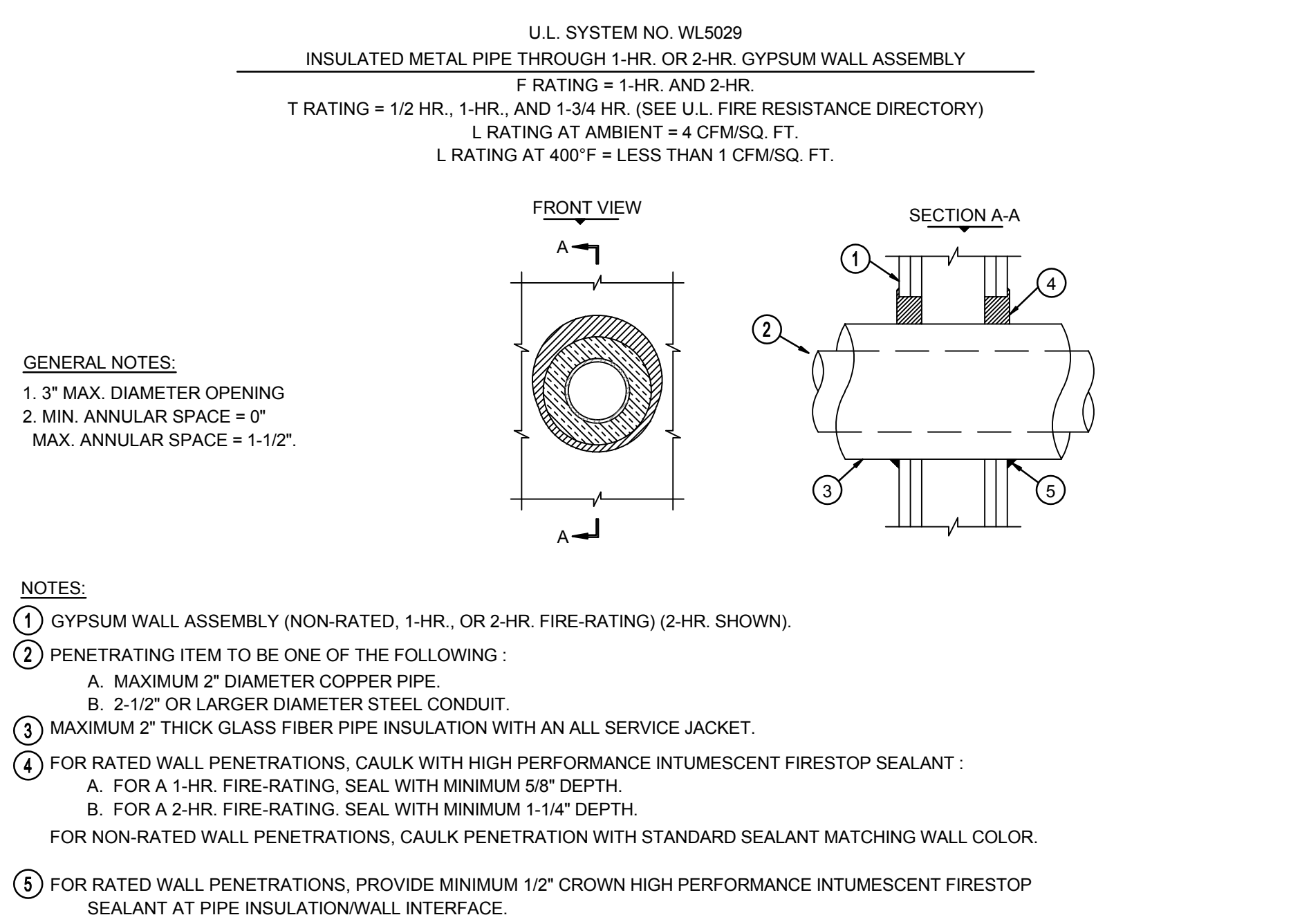
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REFRIGERANT PIPING ROOF SUPPORT

NOT TO SCALE

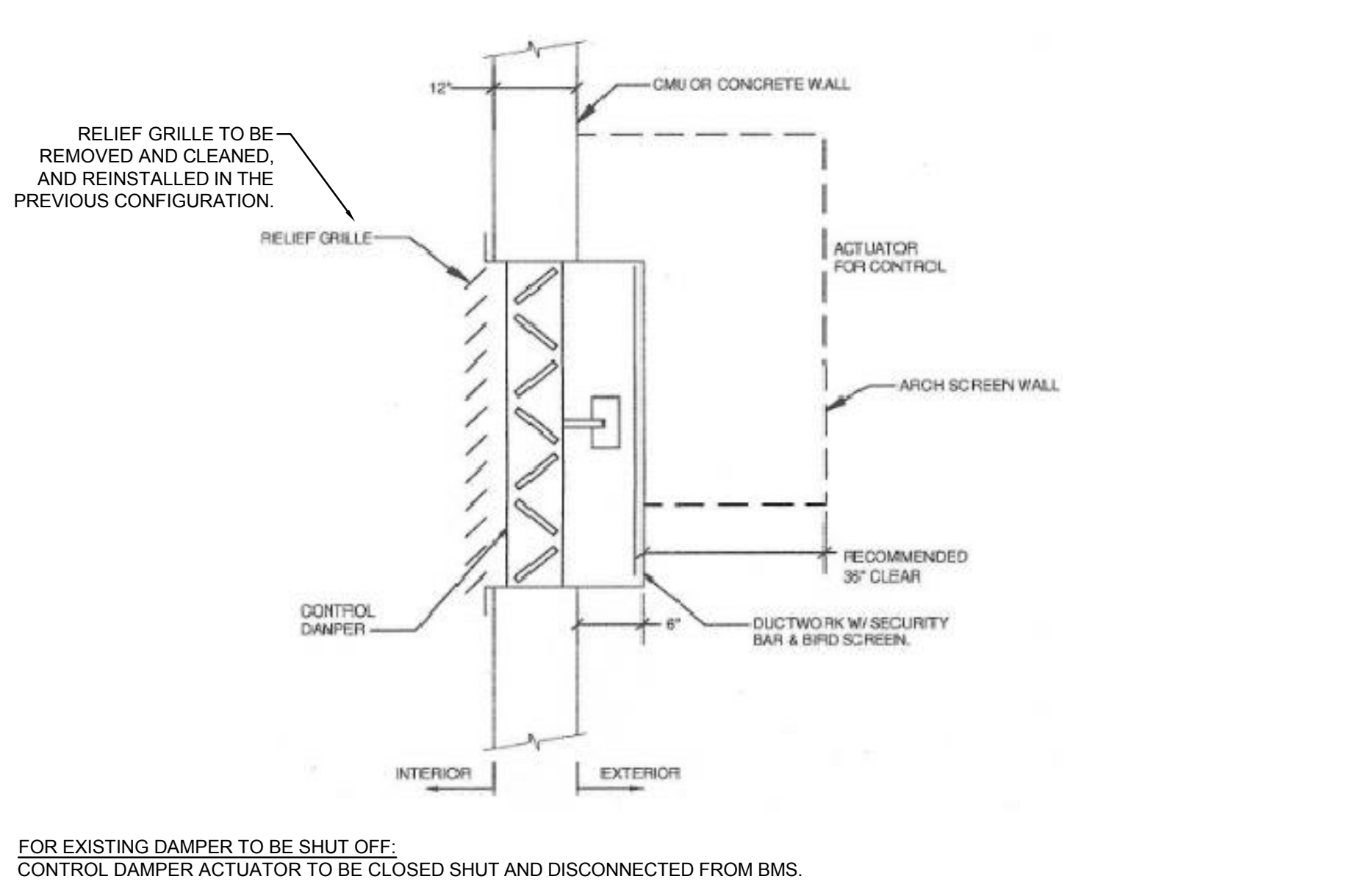
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WALL PIPE PENETRATION DETAIL

NOT TO SCALE

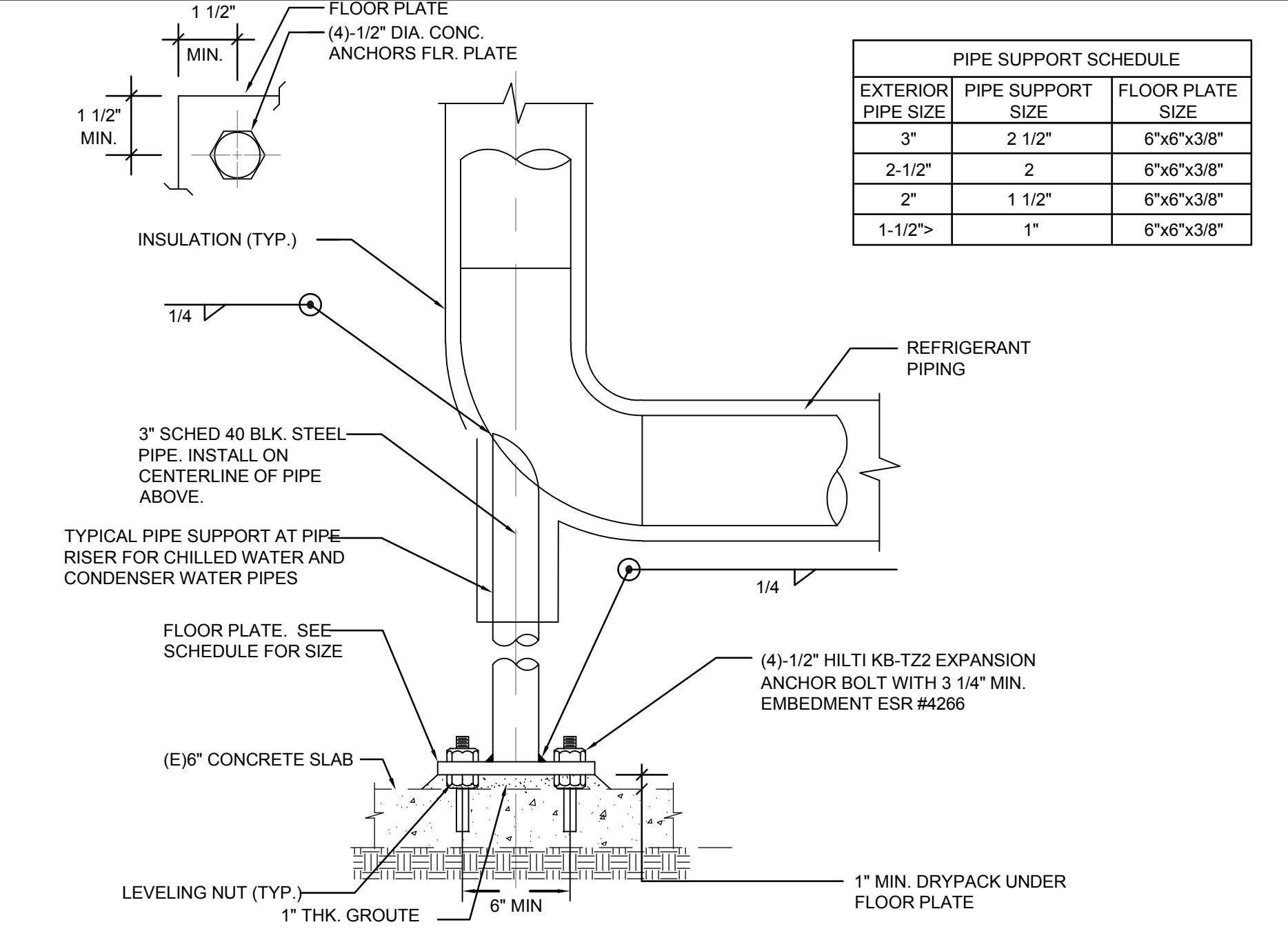
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EXISTING RELIEF GRILLE AND DAMPER DETAIL

NOT TO SCALE

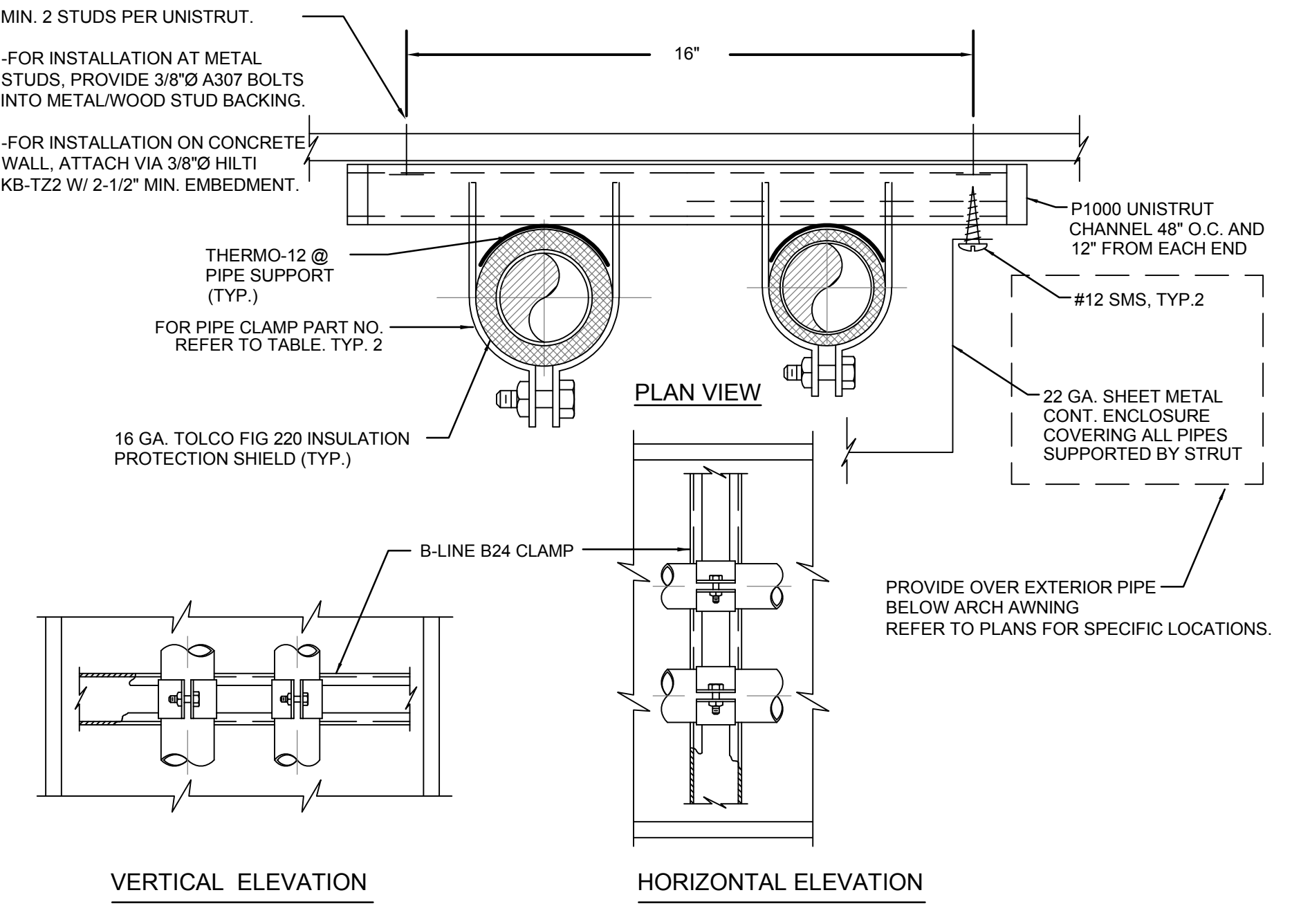
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PIPE SUPPORT DETAIL

NOT TO SCALE

1



P2000 Series & P1430 Pipe Clamps - For Copper Pipe or Tube (Types K, L, M)							
Pipe Clamp Part Number	P2600 UNICUSHION Part Number	P2600 UNICUSHION Cut Length	Nominal Pipe Size	Max. Vertical Capacity (lbs)	Maximum Horizontal Force (lbs)		Installation Torque (ft-lbs)
				C _v Vertical	C _t Transverse	C _l Longitudinal	
P2027	P2600	1 1/2"	3/8"	130	75	65	6
P2028	P2600	2 1/4"	1/2"	130	75	65	6
P2029	P2600	2 1/4"	3/8"	130	75	65	6
P2030	P2600	3"	3/4"	355	100	85	6
P2032	P2600	3 3/4"	1"	355	100	85	6
P2034	P2600	4 1/2"	1 1/4"	355	100	85	6
P1430	P2600	5 1/4"	1 1/2"	355	100	85	11
P2040	P2600	6 3/4"	2"	1,165	265	290	11
P2044	P2600	8 1/4"	2 1/2"	1,165	265	290	11
P2048	P2600	10"	3"	1,165	265	290	11
P2052	P2600	11 1/4"	3 1/2"	1,165	265	290	19
P2056	P2600	12 1/2"	4"	1,525	275	435	19

REFRIGERANT PIPE SUPPORT • WALL / RISER DETAIL

NOT TO SCALE

2

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BONITA UNIFIED SCHOOL DISTRICT

PROJECT:

BONITA H.S. GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

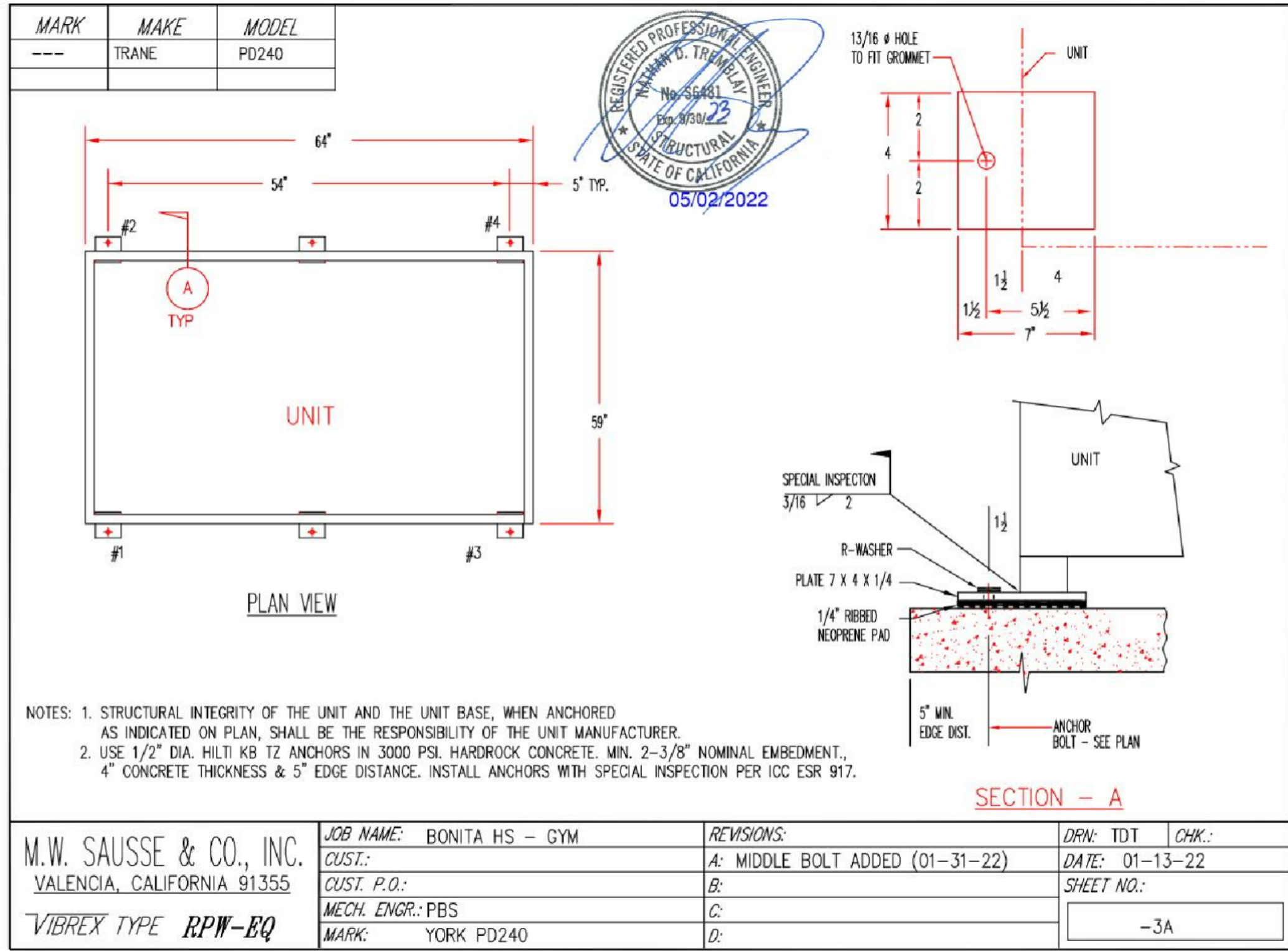
MECHANICAL DETAILS

DRAWING NO.:

M3.2

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APPLICABLE EQPT:		
HP	HP	HP
1	2	3



HEAT PUMP SEISMIC MOUNTING DETAIL

NOT TO SCALE 2

POTTORFF®

Application

Model HAD and CAD duct access doors employ an insulated door panel to provide a convenient and economical means to obtain access to components in ductwork utilized in low to medium pressure and velocity applications.

Standard Construction

Frame: 22 gauge (0.085) 24 ga. (0.7) for doors ≤ 12" x 12" (305 x 305) galvanized steel.

Door Panel: 24 gauge (0.7) galvanized steel — double wall, insulated.

Insulation: 1" (25) thick fiberglass.

Hinge: Zinc plated steel — continuous piano type. (Model HAD only).

Gasket: Compressible closed cell neoprene — door to frame and frame to duct.

Latches: Plated steel — cam type.

Minimum Size: 6" x 6" (152 x 152)

Maximum Size: 24" x 24" (610 x 610)

Options

22 ga. (0.085) galvanized steel door panel.

Additional cam latches.

Window see-through door panel.

1" flanged frame.

Dovetail frame extension for fiberglass duct.

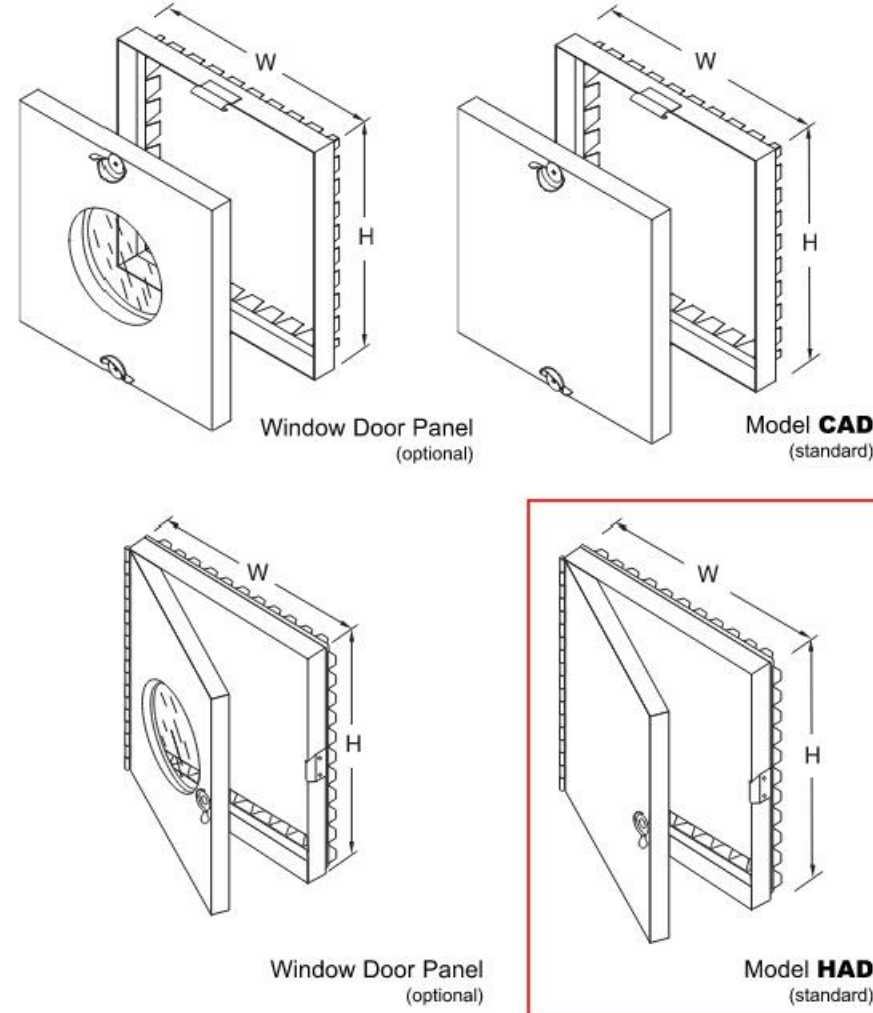
1/2" (13) extension 1" (25) 1 1/2" (38)

Type-304 stainless steel construction.

Ratings

Door Size	Maximum System Pressure
≤12" x 12" (305 x 305)	3.0 in. wg. (0.8 kPa)
>12" x 12" (305 x 305)	2.0 in. wg. (0.5 kPa)

Temperature: -20°F to 200°F (-29°C to +93°C)



Door Size W x H	Duct Opening W x H	Number of Latches		Window Size (Diameter)
		Model HAD	Model CAD	
6" x 6" (152 x 152)	5" x 5" (127 x 127)	1	2	3" (76)
8" x 8" (127 x 127)	7" x 7" (178 x 178)	1	2	6" (152)
10" x 10" (254 x 254)	9" x 9" (229 x 229)	1	2	6" (152)
12" x 12" (305 x 305)	11" x 11" (279 x 279)	1	2	6" (152)
14" x 14" (356 x 356)	13" x 13" (330 x 330)	1	2	6" (152)
16" x 16" (406 x 406)	15" x 15" (381 x 381)	2	4	6" (152)
18" x 18" (457 x 457)	17" x 17" (432 x 432)	2	4	9" (229)
20" x 20" (508 x 508)	19" x 19" (483 x 483)	2	4	9" (229)
24" x 24" (610 x 610)	23" x 23" (584 x 584)	4	4	9" (229)

Information is subject to change without notice or obligation.

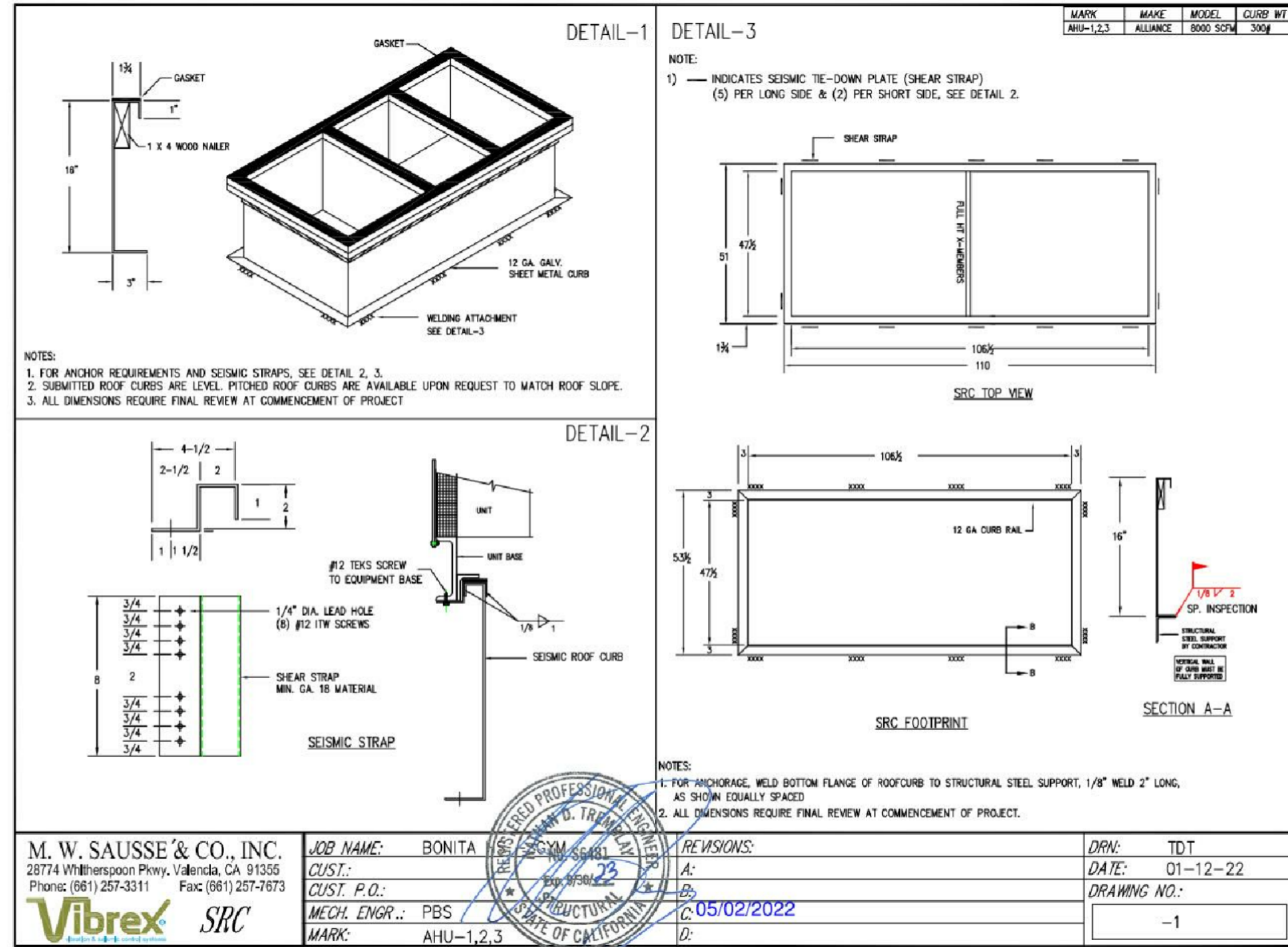
POTTORFF® 5101 Blue Mound Road, Fort Worth, Texas 76106

NOTE: Dimensions in parentheses () are millimeters.

www.pottorff.com

NOTES:
REFER TO DETAIL 1/M3.1 FOR
INSTALLATION DETAIL.

APPLICABLE EQPT:		
AHU	AHU	AHU
1	2	3



CUSTOM AHU SEISMIC MOUNTING DETAIL

NOT TO SCALE 1

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PROJECT:

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GYMNASIUM

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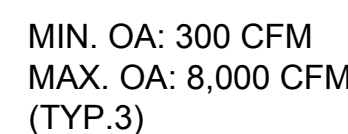
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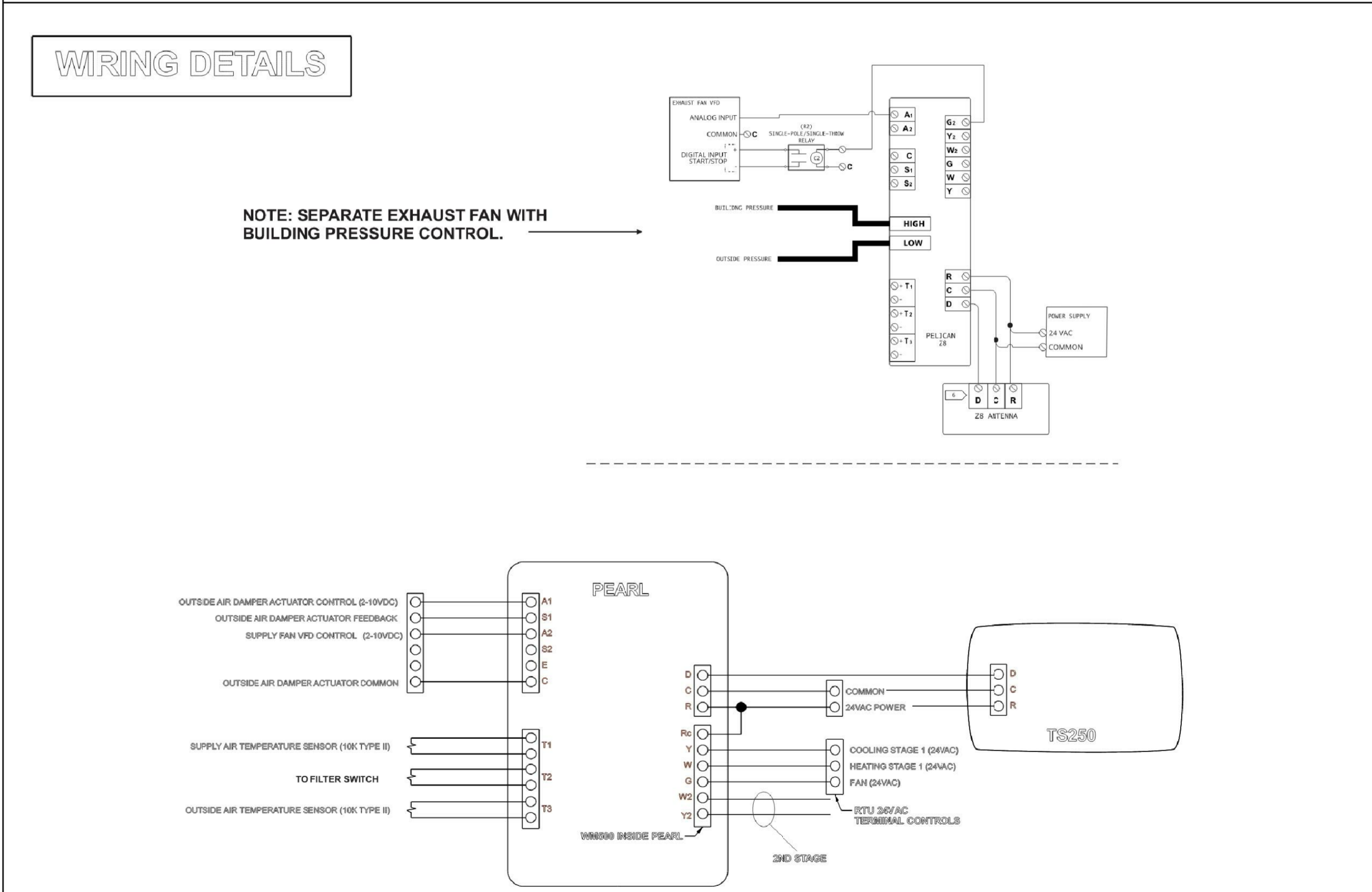
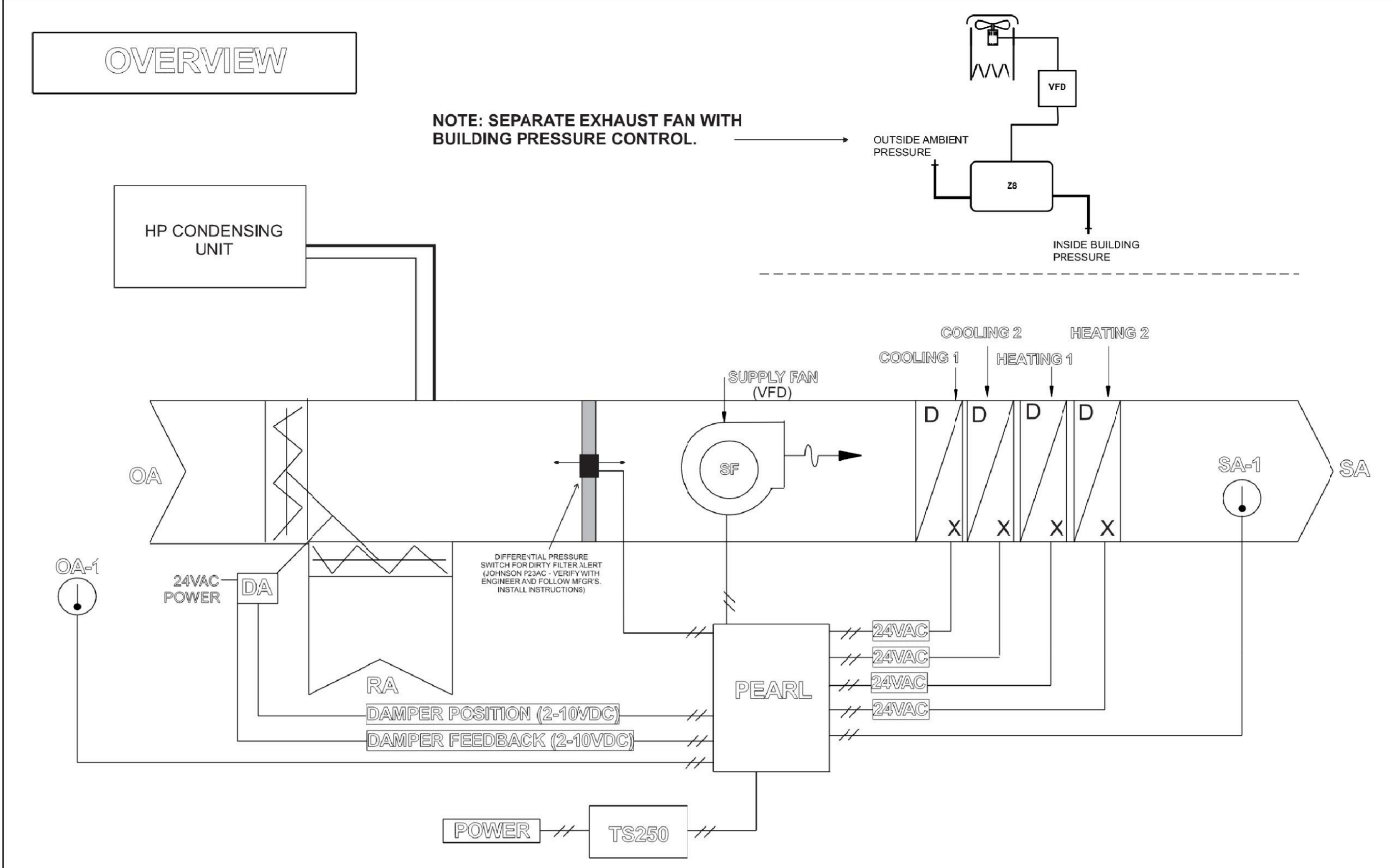
DRAWING TITLE:

MECHANICAL
DETAILS

DRAWING NO.:

M3.3





SEQUENCE OF OPERATIONS

Occupied Mode: Occupied Mode: shall be between 6AM and 6PM (adj) or whenever Co2 sensors detect occupancy outside of scheduled operating hours, to continue operation with 30 minute delay after CO2 level reduces below configured high limit.

Optimum Start: The thermostat will automatically calculate when to start the unit, either in heating or cooling mode to achieve occupied space temperature by start or day. Calculation will be done before each optimum start schedule and be based on seven (7) days of previous run-time for the space. Optimum Start will use economizer to pre-cool the building if outside air temperature is cold enough. During morning warm-up, outside air damper will be closed until occupied hours.

Occupied Heat Demand: If the thermostat needs to heat the space [(i.e. temperature falls below 68 D.F. (adj))], it will enable (G) and (W). At the end of the heating cycle the thermostat will disable the (W) signal. A few minutes after (W) has been disabled, thermostat will disable (G), allowing all conditioned air to be pushed into the space. Outside air damper will be set to configured minimum ventilation position. System shall stage as required.

Occupied Cool Demand: If thermostat needs to cool the space [(i.e. temperature rises above 74 D.F. (adj))] and outside enthalpy allows for outside air to be used, it will open the outside damper as an economizer. Thermostat will enable (G). If outside air is not providing enough cooling or enthalpy is high and unable to be used, thermostat will enable (Y) which will start the compressor. At the end of the cooling cycle thermostat will disable (Y) which will disable the compressor. A few minutes after (Y) has been disabled, thermostat will disable (G), allowing all conditioned air to be pushed into the space. If economization is unable to be used, outside air damper will be set to configured minimum ventilation position. System shall stage as required.

Dead-Band: Thermostat will not allow both heat and cool to run at the same time. Thermostat uses an intelligent auto adjusting dead-band of five degrees to prevent cross over.

Occupied Ventilation: During all occupied periods ventilation will occur during a fan, heating, or cooling cycle. If space Co2 reading rises above configured hi limit, ventilation will be enabled and outside air damper will open beyond minimum. Outside air damper will continue to open to a configured maximum damper position if Co2 continues to rise.

Unoccupied Mode (Night Setback): If space temperature drops below the night setback temperature [(i.e., 60 D.F. adj.)] or rises above the night setback cool temperature [(i.e. 85 D.F. (adj))] the air handling unit shall start and normal and the system shall operate until the zone is satisfied.

Set Points and Schedules: Thermostats will be scheduled to use customer defined occupied and unoccupied set points. For the start of day schedule, thermostats will use Optimum Start. Thermostat will allow limited adjustment from the customer occupied set points (if customer allows). During unoccupied periods thermostat will allow override of unoccupied setbacks, but will go back to the customer's unoccupied setbacks every 2 hours (adj) after the end of day schedule.

Zone Set Point Adjust: The occupant shall be able to adjust the zone temperature heating and cooling set points at the zone sensor. The range of adjustment shall be +/- 2 D.F.

Unoccupied Override: EMS shall allow an occupant to override the schedule and place the unit into an occupied mode for a 60 minute period of time. At the expiration of this time, control of the unit shall automatically return to the normal schedule.

Exhaust Fan: If building pressure rises above the maximum limit, exhaust fan will be modulated to maintain building pressure at set limit. If building pressure is below set limit, exhaust fan will be off.

Dirty Filter Alert: upon reaching the pressure drop set on filter switch (adjustable), EMS shall issue alert via webapp, and/or text and email. Verify setting with engineer.

CONFIGURATION

THERMOSTAT CONFIGURATION WITH THE PELICAN WEB-APP
GO TO ADMIN > THERMOSTAT CONFIGURATION.

THERMOSTAT SETTINGS:
SYSTEM TYPE: CONVENTIONAL
HEAT STAGES: 2
COOL STAGES: 2
FAN STAGES: VARIABLE
HEAT NEEDS FAN: NO

CO2 VENTILATION: 1000PPM

ECONOMIZER: ON
AUTO CONFIG: NO
HIGH LIMIT SHUT OFF: AUTO
ACTIVATION DIFFERENTIAL: DEFAULT
FIXED ENTHALPY LIMIT: OPTIONAL
VARIABLE DAMPER: YES
DAMPER VOLTAGES: OPEN 10.0, CLOSED 2.0
MINIMUM DAMPER POSITION: 10% (ADJ.)
TRACK DAMPER POSITION: YES
DEMAND VENTILATION: OPTIONAL W/TS250 (TBD)
MAX. VENTILATION POSITION: OPTIONAL 100% (ADJ.)

INPUT SENSOR T1: SUPPLY AIR TEMPERATURE

INPUT SENSOR T2: ALERT (LABEL: DIRTY FILTER ALERT)

INPUT SENSOR T3: OUTSIDE AIR TEMPERATURE

FOR CONFIGURATION ASSISTANCE, CONTACT TECHNICAL SUPPORT TO CONFIGURE. GIVE THEM THE PROJECT NAME FOR REFERENCE.

PELICAN Z8 CONFIGURATION

NAME: ED-1
DESCRIPTION:
MODULATES EXHAUST DAMPER TO BUILDING PRESSURE

SYSTEM SETTINGS:
SYSTEM TYPE: CONVENTIONAL
HEAT STAGES: 0
COOL STAGES: 0
FAN STAGES: 1

BUILDING STATIC CONTROL: ON (THIS IS CONFIGURED BY PELICAN EVEN THOUGH THIS IS A MOD FAN FOR PROPER SEQUENCING)
MODULATE CONTROLTYPE (A1): VARIABLE FAN (SET TO VARIABLE FAN,
CONTROL VOLTAGE: OPEN: 10.0 CLOSED: 2.0
MAXIMUM BUILDING STATIC: 0.05
START EXHAUST FIRST (G2): NO

VARIABLE SPEED FAN: ON

BYPASS CONTROLLER: OFF

STATIC PRESSURE: ON

ECONOMIZER: OFF

BOILER CONTROLLER: OFF

INPUT SENSOR T1: OFF

INPUT SENSOR T2: OFF

INPUT SENSOR T3: OFF

PROJECT NUMBER: P-220202945	REV. NO. REV01	DRAWING TITLE: AHUs 1 THROUGH 3 WITH BUILDING PRESSURE CONTROLLED EXHAUST FANS	DRAWN BY: PWS	SCALE: NTS	
	PROJECT NAME: BONITA HS GYM		DATE CREATED:	PAGE 1 OF 1	

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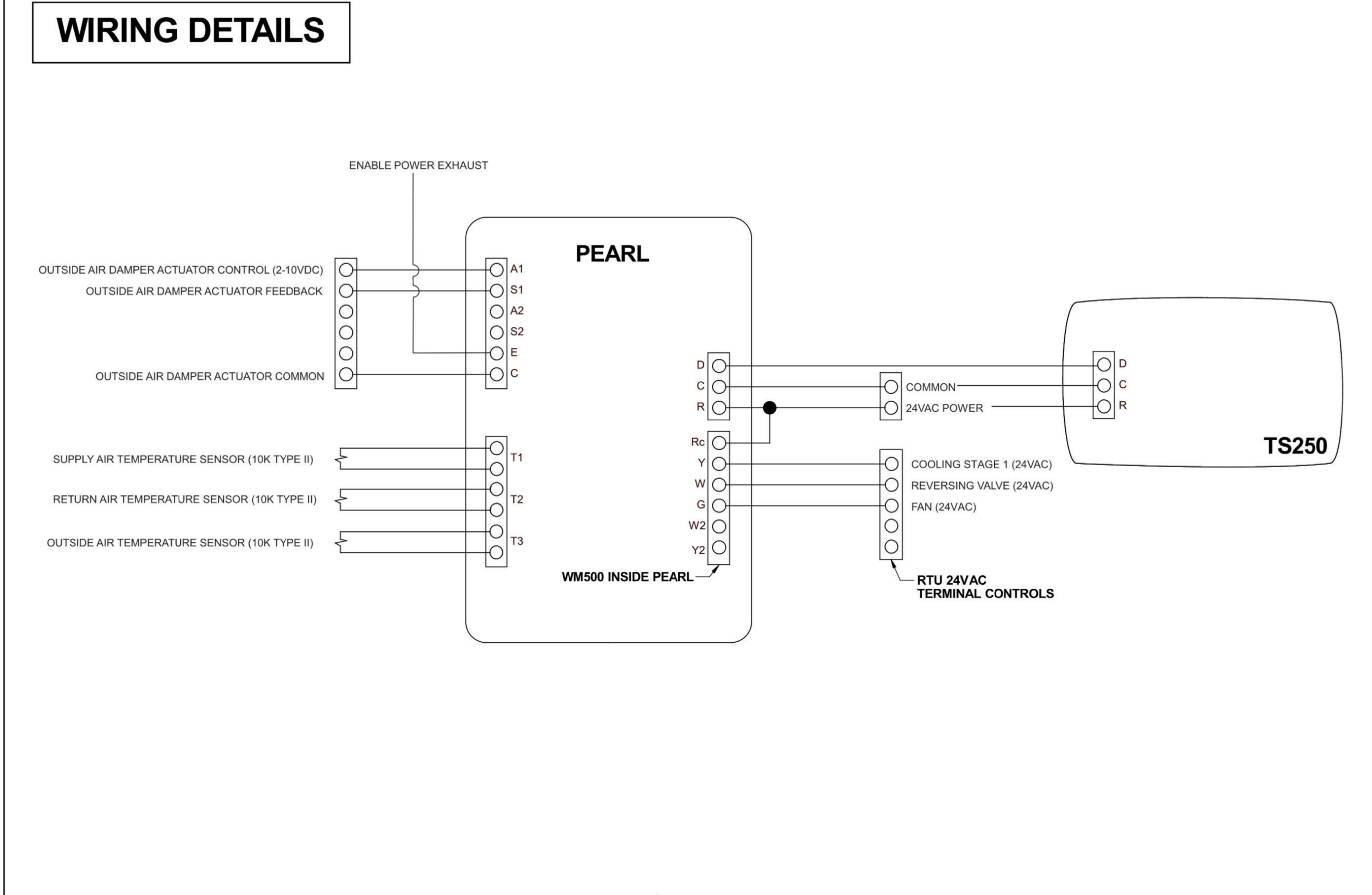
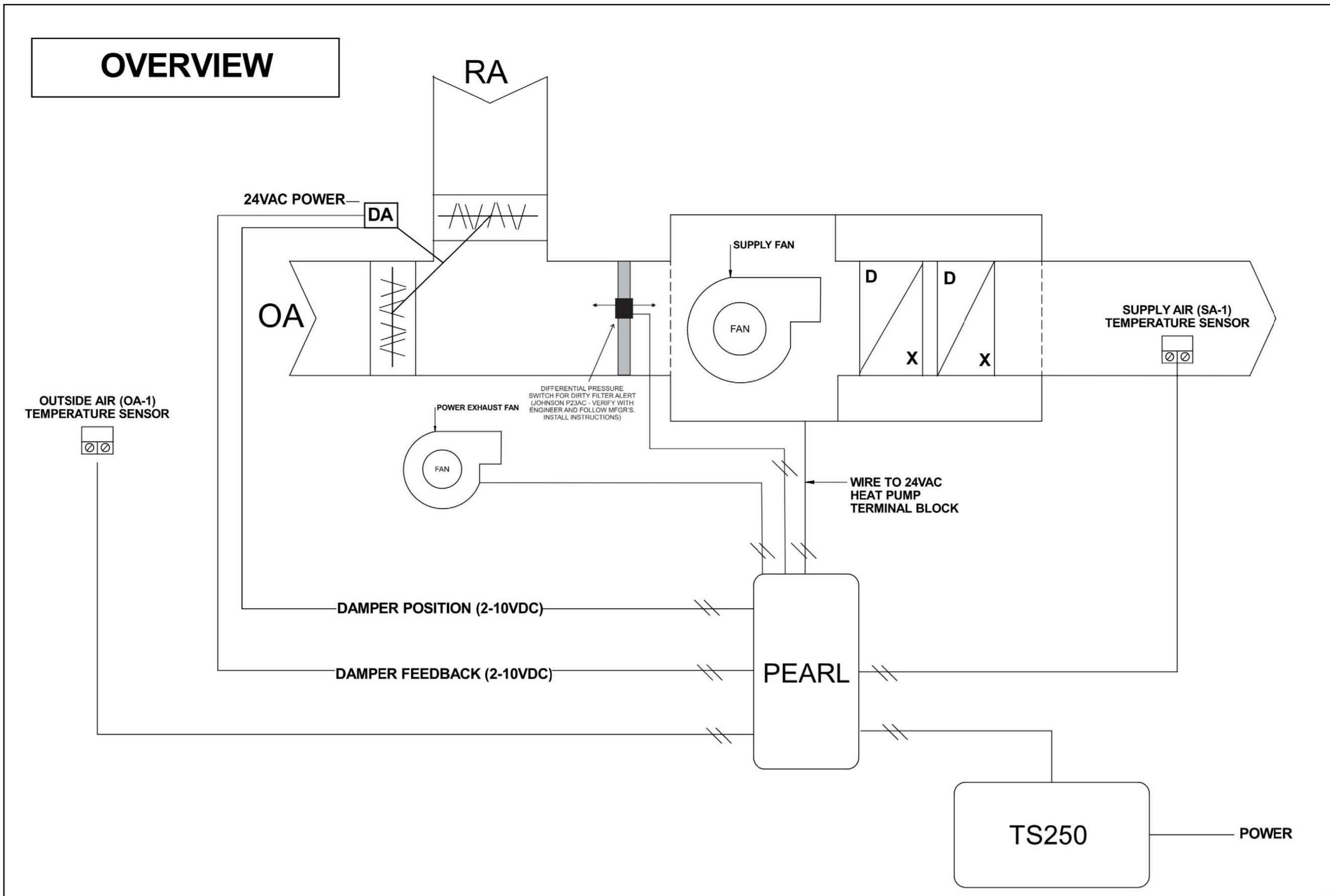
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REVISION: DATE:

DRAWING TITLE:
MECHANICAL CONTROLS

DRAWING NO.:

M4.1

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PROJECT NUMBER: P-2202151146	REV. NO. REV01	DRAWING TITLE: AHU-4 Heat Pump with Economizer and Power Exhaust
	PROJECT NAME: Bonita HS Gym	

SEQUENCE OF OPERATIONS

Occupied Mode: Occupied Mode: shall be between 6AM and 6PM (adj) or whenever Co2 sensors detect occupancy outside of scheduled operating hours, to continue operation with 30 minute delay after CO2 level reduces below configured high limit.

Optimum Start: The thermostat will automatically calculate when to start the unit, in either heating or cooling mode, to achieve occupied space temperature by start-of-day. Calculation will be done before each optimum start schedule and be based on seven (7) days of previous run-time for the space.

During occupied hours thermostat will be scheduled to district start times, fan ON, and temperature set-points. Schedules will begin in Optimum Start mode and thermostat will auto-calculate when to turn on HVAC equipment to bring space up or down to set-point temperature.

During an occupied cooling cycle, thermostat will enable mechanical cooling and bring on fan. Cooling will remain enabled until space temperature is close to temperature set-point. If supply temperature does not reach 65 deg F. (adjustable) within 10 minutes or drops below 40 deg F. (adjustable) a supply temperature alarm will be generated at EMS. If space does not cool at a proper rate, alarm will be generated at EMS. Cooling will be disabled and fan will remain enabled to purge excess cooling out of HVAC equipment (based on DAT) while bringing space temperature to match cooling set-point.

During an occupied heating cycle, thermostat will enable mechanical heating and bring on fan. Heating will remain enabled until space temperature is close to temperature set-point. If supply temperature does not reach 80 D.F. (adjustable) within 10 minutes or rises above 170 D.F. (adjustable) a supply temperature alarm will be generated at EMS. If space does not heat at a proper rate, alarm will be generated at EMS. Heating will be disabled and fan will remain enabled to purge excess heating out of HVAC equipment (based on DAT) while bringing space temperature to match heating set-point.

Damper Control with CO2 and Economizer: If the space CO2 sensor indicates that the space CO2 level is above 1000 PPM (adj.), the volume of outside air will be increased based on a ratio of low CO2 concentration at the minimum damper position to high CO2 concentration at maximum open; a maximum damper position (adj.) will be enforced to prevent the outside air damper from opening beyond the calculated maximum ventilation rate for the space. Power exhaust shall enable upon activation of economizer.

Unoccupied Mode: The supply shall be off and the outside and relief air dampers shall be closed. If space temperature drops below the night setback heat temperature or raises above the night setback cool temperature, the air handling unit shall start as normal and the system shall operate until the zone is satisfied. Outside air damper shall remain closed during all unoccupied scheduled periods.

Set-Points and Schedule: Thermostats will be scheduled to use district defined occupied and unoccupied set-points. For the start-of-day schedule, thermostat will use Optimum Start. Thermostat will allow a limited adjustment from the district occupied set-points. During unoccupied periods thermostat will allow override of unoccupied setbacks, but will go back to the district's unoccupied setbacks every 2 hours after the end-of-day schedule.

NOTE: DETAIL/WIRING DIAGRAM IS SCHEMATIC IN NATURE. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL MANUFACTURER'S REQUIRED COMPONENTS, MODEL NUMBERS, WIRING AND DEVICES AS REQUIRED FOR SPECIFIED OPERATION.

Dirty Filter Alert: upon reaching the pressure drop set on filter switch (adjustable), EMS shall issue alert via webapp, and/or text and email. Verify setting with engineer.

CONFIGURATION

FOR CONFIGURATION ASSISTANCE, CONTACT TECHNICAL SUPPORT TO CONFIGURE. GIVE THEM THE PROJECT NUMBER FOR REFERENCE.


THERMOSTAT CONFIGURATION WITH THE PELICAN WEB-APP, GO TO ADMIN > THERMOSTAT CONFIGURATION.

THERMOSTAT SETTINGS:
SYSTEM TYPE: HEAT PUMP
HEAT STAGES: 1
AUX HEAT: OFF
COOL STAGES: 1
FAN STAGES: 1

CO2 VENTILATION: 1000 PPM

ECONOMIZER: ON
AUTO CONFIG: NO
HIGH LIMIT SHUT OFF: AUTO
VARIABLE DAMPER: YES
DAMPER VOLTAGES: TBD
MINIMUM DAMPER POSITION: TBD
TRACK DAMPER POSITION: YES
DEMAND VENTILATION: OFF


INPUT SENSOR T1: SUPPLY TEMPERATURE
INPUT SENSOR T2: ALERT: (LABEL: DIRTY FILTER ALERT)
INPUT SENSOR T3: OUTSIDE TEMPERATURE


DRAWN BY: PWS	SCALE: NTS	
DATE CREATED: 2/15/22	PAGE 1 OF 1	

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CONSULTANTS STAMP:


SCHOOL DISTRICT:
BONITA UNIFIED SCHOOL DISTRICT

PROJECT:
BONITA H.S. GYMNASIUM

JOB NUMBER:
DATE: 2022-01-14

REVISION:  DATE: _____
REVISION:  DATE: _____

DRAWING TITLE:
MECHANICAL CONTROLS

DRAWING NO.:

M4.2

GENERAL NOTES		DEMOLITION NOTES		SHEET INDEX																							
<div>1. THE SEISMIC BRACING AND ANCHORAGE OF ELECTRICAL CONDUITS, BUS DUCT, WIREWAY, AND CABLE TRAY SHALL BE IN ACCORDANCE WITH THE "GUIDELINE FOR SEISMIC RESTRAINTS OF MECHANICAL SYSTEMS AND PLUMBING PIPING SYSTEMS," PUBLISHED BY SMACNA AND PPIC.</div> <div>2. ALL ELECTRICAL EQUIPMENT SHALL BE BRACED OR ANCHORED TO RESIST A HORIZONTAL FORCE ACTING IN ANY DIRECTION USING THE FOLLOWING CRITERIA: FIXED EQUIPMENT ON GRADE 20% OF OPERATING WEIGHT FIXED EQUIPMENT ON STRUCTURE 30% OF OPERATING WEIGHT. FOR FLEXIBLY MOUNTED EQUIPMENT, USE 4 TIMES THE ABOVE VALUES. FOR SIMULTANEOUS VERTICAL FORCE, USE 1/3 TIMES THE HORIZONTAL FORCE. WHERE ANCHORAGE DETAILS ARE NOT INDICATED ON THE DRAWINGS, THE FIELD INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE ARCHITECT AND THE FIELD INSPECTOR. WHERE ANCHORAGE IS INDICATED ON THE CONTRACT DOCUMENTS, ANCHORAGE SHALL BE AS PER THE CONTRACT DOCUMENTS.</div> <div>3. ALL ELECTRICAL PREFABRICATED EQUIPMENT SHALL BE DESIGNED AND CONSTRUCTED IN SUCH A MANNER THAT ALL PORTIONS, ELEMENTS, SUB-ASSEMBLIES AND/OR PARTS OF SAID EQUIPMENT, AND THE EQUIPMENT AS A WHOLE INCLUDING ITS ATTACHMENTS, WILL RESIST A LOAD WHICH EXCEEDS THE FORCE LEVEL USED TO RESTRAIN AND ANCHOR THE EQUIPMENT TO THE SUPPORTING STRUCTURE.</div> <div>4. ALL ELECTRICAL MATERIALS AND EQUIPMENT SHALL BE NEW AND SHALL BE LISTED BY UNDERWRITER'S LABORATORIES (UL) AND BEAR THEIR LABEL, OR LISTED AND CERTIFIED BY A NATIONALLY RECOGNIZED TESTING AUTHORITY WHERE UL DOES NOT HAVE A LISTING. CUSTOM MADE EQUIPMENT SHALL HAVE COMPLETE TEST DATA SUBMITTED BY THE MANUFACTURER ATTESTING TO ITS SAFETY. IN ADDITION, THE MATERIALS, EQUIPMENT, AND INSTALLATION SHALL COMPLY WITH THE REQUIREMENTS OF THE FOLLOWING: AMERICAN SOCIETY OF TESTING MATERIALS (ASTM) INSULATED POWER CABLE ENGINEERS ASSOCIATION (IPCEA) NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) AMERICAN STANDARD ASSOCIATION (ASA) NATIONAL FIRE PROTECTION AGENCY (NFPA) AMERICAN NATIONAL STANDARD INSTITUTE (ANSI) CALIFORNIA ELECTRICAL CODE (CEC) - LATEST EDITION CALIFORNIA CODE OF REGULATIONS TITLE 24 (CCR) INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE) DSA STANDARDS AND CODES HAVING JURISDICTION.</div> <div>5. WHERE THE CODES HAVE DIFFERENT LEVELS OF REQUIREMENTS, THE MOST STRINGENT RULE SHALL APPLY.</div> <div>6. THE CONTRACTOR SHALL VISIT THE SITE INCLUDING ALL AREAS INDICATED ON THE DRAWINGS. HE SHALL THOROUGHLY FAMILIARIZE HIMSELF WITH THE EXISTING CONDITIONS AND BY SUBMITTING A BID, ACCEPTS THE CONDITIONS UNDER WHICH HE SHALL BE REQUIRED TO PERFORM HIS WORK.</div> <div>7. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN A COMPLETE SET OF CONTRACT DOCUMENTS, ADDENDA, DRAWINGS AND SPECIFICATIONS. HE SHALL CHECK THE DRAWINGS OF THE OTHER TRADES AND SHALL CAREFULLY READ THE ENTIRE SPECIFICATIONS AND DETERMINE HIS RESPONSIBILITIES. FAILURE TO DO SO SHALL NOT RELEASE THE CONTRACTOR FROM DOING THE WORK IN COMPLETE ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS.</div> <div>8. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH OTHER TRADES AT THE SITE. ANY COSTS TO INSTALL WORK TO ACCOMPLISH SAID COORDINATION WHICH DIFFERS FROM THE WORK AS SHOWN ON THE DRAWINGS SHALL BE INCURRED BY THE CONTRACTOR. ANY DISCREPANCIES, AMBIGUITIES OR CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT DURING BID TIME FOR CLARIFICATION. ANY SUCH CONFLICTS NOT CLARIFIED PRIOR TO BID SHALL BE SUBJECT TO THE INTERPRETATION OF THE ARCHITECT AT NO ADDITIONAL COST TO THE OWNER.</div> <div>9. THE CONTRACTOR SHALL PROVIDE AND KEEP UP-TO-DATE A COMPLETE RECORD SET OF DRAWINGS. THESE PRINTS SHALL BE CORRECTED DAILY AND SHOW EVERY CHANGE FROM THE ORIGINAL DRAWINGS. THIS SET OF DRAWINGS SHALL BE KEPT ON THE JOB SITE AND SHALL BE USED ONLY AS A RECORD SET. THIS SHALL NOT BE CONSTRUED AS AUTHORIZATION FOR THE CONTRACTOR TO MAKE CHANGES IN THE LAYOUT WITHOUT DEFINITE INSTRUCTION IN EACH CASE. UPON COMPLETION OF THE WORK, ALL CHANGES AS NOTED ON THE RECORD SET OF DRAWINGS SHALL BE INCORPORATED ON REPRODUCIBLE VELLUM WITH BLACK INK IN A NEAT, LEGIBLE, UNDERSTANDABLE AND PROFESSIONAL MANNER. FAILURE TO KEEP RECORD DRAWINGS UP-TO-DATE SHALL CONSTITUTE CAUSE FOR WITHHOLDING OF PROGRESS PAYMENTS.</div> <div>10. IN SOME INSTANCES, IT MAY BE NECESSARY TO DEFER WORK IN CERTAIN AREAS AND LOCATIONS UNTIL SUCH TIME AS EXISTING FACILITIES CAN BE TEMPORARILY OR PERMANENTLY REARRANGED BY THE OWNER. THEREFORE, WHENEVER IT BECOMES NECESSARY FOR THE CONTRACTOR TO PERFORM WORK UNDER THIS CONTRACT IN EXISTING AREAS IN WHICH THE OWNER'S WORK IS BEING PERFORMED, THE CONTRACTOR SHALL ADVISE THE ARCHITECT AND THE OWNER RELATIVE TO THIS REQUIREMENT AND SHALL FOLLOW CLOSELY THE DIRECTIVE ISSUED BY THE ARCHITECT INSOFAR AS TIME AND PROCEDURE ARE CONCERNED. THE CONTRACTOR SHALL INCLUDE IN HIS BID ALL PREMIUM TIME TO WHICH HE MAY BE SUBJECTED FOR PERFORMING WORK IN SUCH PROCEDURE AND AT SUCH TIMES AS MAY BE NECESSARY TO CAUSE THE LEAST INTERFERENCE WITH THE OPERATIONS OF THE OWNER.</div> <div>11. ALL INTERRUPTION OF ELECTRICAL POWER SHALL BE KEPT TO A MINIMUM. HOWEVER, WHEN AN INTERRUPTION IS NECESSARY, THE SHUTDOWN MUST BE COORDINATED WITH THE OWNER AND ENGINEER 14 DAYS PRIOR TO THE OUTAGE. ANY OVERTIME PAY AND WORK REQUIRED TO BE ACCOMPLISHED ON WEEKENDS SHALL BE INCLUDED IN THE CONTRACTOR'S BID. WORK IN EXISTING SWITCHBOARDS OR PANELBOARDS SHALL BE COORDINATED WITH THE OWNER PRIOR TO REMOVING ACCESS PANELS OR DOORS.</div> <div>12. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE TEMPORARY POWER FACILITIES AND CONNECTIONS FOR ALL FEEDERS OR SYSTEMS BEING DISCONNECTED IN ORDER TO MAINTAIN SYSTEMS IN OPERATION OR WHERE SAID FEEDERS OR SYSTEMS REQUIRE EMERGENCY STANDBY POWER.</div> <div>13. SHOP DRAWINGS SHALL BE SUBMITTED WITHIN THIRTY DAYS AFTER AWARD OF THE CONTRACT. THE CONTRACTOR SHALL SUBMIT EIGHT COPIES OF A COMPLETE LIST OF MATERIALS AND EQUIPMENT INCLUDING MANUFACTURER AND MODEL NUMBER PROPOSED FOR THE JOB. SHOP DRAWINGS SHALL INCLUDE JOB DESCRIPTION, ARCHITECT AND ENGINEER IDENTIFICATION, AND ALL DATA WITH CAPACITIES, SIZES, DIMENSIONS, CATALOG NUMBERS, AND MANUFACTURER'S BROCHURES. SHOP DRAWINGS SHALL BE SUBMITTED FOR ITEMS LISTED IN SPECIFICATIONS. PARTIAL, INCOMPLETE, OR UNBOUND SUBMITTALS WILL BE RETURNED WITHOUT REVIEW. CONTRACTOR SHALL SUBMIT A SCHEDULE OF ALL SHOP DRAWINGS AND SUBMITTALS WHICH ARE TO BE REVIEWED WITHIN 15 DAYS OF CONTRACT AWARD.</div> <div>14. AFTER ALL REQUIREMENTS OF THE SPECIFICATIONS AND/OR THE DRAWINGS HAVE BEEN FULLY COMPLETED, REPRESENTATIVES OF THE OWNER WILL INSPECT THE WORK. THE CONTRACTOR SHALL PROVIDE COMPETENT PERSONNEL TO DEMONSTRATE THE OPERATION OF ANY ITEM OR SYSTEM TO THE FULL SATISFACTION OF EACH REPRESENTATIVE. FINAL ACCEPTANCE OF THE WORK WILL BE MADE BY THE OWNER AFTER RECEIPT OF APPROVAL AND RECOMMENDATION OF ACCEPTANCE FROM EACH REPRESENTATIVE.</div> <div>15. THE CONTRACTOR SHALL FURNISH A ONE YEAR WRITTEN GUARANTEE OF MATERIALS AND WORKMANSHIP FROM THE DATE OF SUBSTANTIAL COMPLETION.</div> <div>16. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW AND TO COORDINATE WITH THE MECHANICAL, FIRE PROTECTION AND PLUMBING DRAWINGS FOR DUCTS, LINES AND EQUIPMENT.</div> <div>17. ALL FINAL CONNECTIONS TO OWNER FURNISHED EQUIPMENT SHALL BE MADE BY THE CONTRACTOR.</div> <div>18. COORDINATE WITH OTHER TRADES AS TO THE EXACT LOCATION OF THEIR RESPECTIVE EQUIPMENT. SUPPLY POWER AND MAKE CONNECTION TO MOTORS AND EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS AS INDICATED ON THE SINGLE LINE DIAGRAM, ELECTRICAL DRAWINGS, AND DRAWINGS OF OTHER TRADES. REVIEW THE DRAWINGS OF OTHER TRADES FOR CONTROL DIAGRAMS, SIZE AND LOCATION OF EQUIPMENT. DISCONNECT SWITCHES, STARTERS, WIRING, CONTROLS, AND CONDUIT FOR MECHANICAL AND PLUMBING OPERATIONS SHALL BE PROVIDED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING MANUFACTURER'S SHOP DRAWINGS PRIOR TO ROUGHING IN ALL CONDUIT TO THIS EQUIPMENT.</div> <div>19. EXACT METHOD AND LOCATION OF CONDUIT PENETRATION AND OPENINGS IN CONCRETE WALLS OR FLOORS OR STRUCTURAL STEEL MEMBERS SHALL BE AS DIRECTED BY THE STRUCTURAL ENGINEER. PERFORM CORING, SAWCUTTING, PATCHING, AND REFINISHING OF EXISTING WALLS AND SURFACES WHEREVER IT IS NECESSARY TO PENETRATE. OPENINGS SHALL BE SEALED IN AN APPROVED METHOD TO MEET THE FIRE RATING OF THE PARTICULAR WALL, FLOOR OR CEILING. EXACT METHOD AND LOCATIONS OF CONDUIT PENETRATIONS AND OPENINGS IN CONCRETE WALLS OR FLOORS SHALL BE UL APPROVED. ALL FLOOR PENETRATIONS MUST BE X-RAYED BEFORE ANY CORING IS DONE.</div> <div>20. CONNECTIONS TO MECHANICAL EQUIPMENT AND VIBRATING EQUIPMENT: LIQUID-TIGHT FLEXIBLE STEEL CONDUIT IN DRY INTERIOR LOCATIONS, LIQUID-TIGHT FLEXIBLE STEEL CONDUIT IN AREAS EXPOSED TO WEATHER, DAMP LOCATIONS, CONNECTIONS TO TRANSFORMER ENCLOSURES, AND FINAL CONNECTIONS TO MOTORS PROVIDE A SEPARATE INSULATED EQUIPMENT GROUNDING CONDUCTOR IN ALL FLEXIBLE CONDUIT RUNS. MAXIMUM LENGTH SHALL BE THIRTY-SIX INCHES UNLESS OTHERWISE NOTED.</div>		<div>1. IN GENERAL, THE DEMOLITION PLAN SHOWS ALL EXISTING EQUIPMENT TO BE REMOVED; HOWEVER, ELECTRICAL EQUIPMENT, WHETHER SHOWN ON THIS DRAWINGS OR NOT THAT IS LOCATED IN REMOVED WALLS, FLOORS OR CEILINGS, SHALL BE REMOVED UNLESS OTHERWISE NOTED.</div> <div>2. THE ELECTRICAL CONTRACTOR SHALL COORDINATE WITH THE OWNER, PRIOR TO REMOVAL OF EXISTING ELECTRICAL EQUIPMENT, AND TURN OVER REMOVED EQUIPMENT THAT THE OWNER REQUESTS IN AN "AS- FOUND" CONDITION. EQUIPMENT THAT IS TO BE TURNED OVER SHALL BE BOXED AND TAGGED TO IDENTIFY THE SPECIFIC EQUIPMENT.</div> <div>3. EXISTING CONDUIT MAY BE REUSED IF ADEQUATELY SIZED AND IF IT IS STILL OPERABLE AND IN GOOD CONDITION. EXISTING CONDUCTORS MAY BE REUSED FOR SPLICING. REFER TO DRAWINGS FOR LOCATIONS. PRIOR TO REUSE, THE ENTIRE LENGTH OF THE EXISTING CONDUIT SHALL BE MANDEARED TO VERIFY THE INTEGRITY OF THE INSTALLED CONDUIT.</div> <div>4. IN SOME INSTANCES, IT MAY BE NECESSARY FOR THE ELECTRICAL CONTRACTOR TO TEMPORARILY RELOCATE, REROUTE, ETC., EXISTING ELECTRICAL EQUIPMENT. THIS SHALL BE DONE SO THAT THE SYSTEMS, IN ALL PHASES (THOSE COMPLETED AND THOSE YET TO BEGIN), ARE IN COMPLETE, OPERABLE, CONDITION AS CONSTRUCTION PROCEEDS THROUGH EACH PHASE.</div> <div>5. ALL IN SERVICE CIRCUIT INCLUDING FIRE ALARM, SECURITY, AND TELEPHONE THAT MAYBE INTERRUPTED AS PART OF THIS WORK SHALL BE COORDINATED WITH THE OWNER.</div> <div>6. CONTRACTOR SHALL COORDINATE DEMOLITION, WITH ADJACENT AREA AND ENSURE CONTINUITY OF OPERATION FOR ADJACENT SPACES INCLUDING LIGHTING, POWER, DATA, SECURITY, PA, AND FIRE ALARM. CONTRACTOR SHALL INVESTIGATE AND VERIFY EXISTING CONDITIONS PRIOR TO STARTING WORK.</div> <div>7. CONTRACTOR SHALL INCLUDE IN THE BID ALL LABOR, MATERIALS, TOOLS, PLANT, TRANSPORTATION, STORAGE COSTS, EQUIPMENT, INSURANCE, TEMPORARY PROTECTION, PERMITS, INSPECTIONS, TAXES AND ALL NECESSARY AND RELATED ITEMS REQUIRED TO PROVIDE COMPLETE DEMOLITION AND RESTORATION OF EXISTING SYSTEMS.</div> <div>8. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING AND COORDINATING PHASED ACTIVITIES AND CONSTRUCTION METHODS THAT MINIMIZE DISRUPTION OF OPERATIONS AND PROVIDE COMPLETE AND OPERATIONAL SYSTEMS.</div> <div>9. THE CONTRACTOR SHALL COORDINATE INTERFACES TO EXISTING SYSTEMS THAT ARE BEING DEMOLISHED IN ORDER TO MINIMIZE DISRUPTION TO THE EXISTING SYSTEMS OPERATIONS. ANY SYSTEMS OUTAGES SHALL BE APPROVED IN ADVANCE AND SCHEDULED WITH THE OWNER.</div> <div>10. ALL ELECTRICAL BUILDING INFRASTRUCTURE COMPONENTS INCLUDING CONDUITS, CONDUCTORS, SUPPORTS, BOXES, CONNECTORS, ETC. TO BE DEMOLISHED, NOT LEFT ABANDON IN PLACE, IF NOT CURRENTLY BEING USED AND/OR SCHEDULED FOR USE OR REUSE.</div>		<table><tr><th>SHT NO.</th><th>DESCRIPTION</th></tr><tr><td>E0.1</td><td>GENERAL NOTES, APPLICABLE CODES AND SHEET INDEX</td></tr><tr><td>E0.2</td><td>SYMBOLS LIST & ABBREVIATIONS</td></tr><tr><td>E0.3</td><td>SINGLE LINE DIAGRAM AND PANEL SCHEDULE</td></tr><tr><td>E2.1</td><td>ELECTRICAL REMODEL FLOOR PLAN</td></tr><tr><td>E2.2</td><td>ELECTRICAL DEMO ROOF PLAN</td></tr><tr><td>E2.3</td><td>ELECTRICAL REMODEL ROOF PLAN</td></tr><tr><td>E3.1</td><td>ELECTRICAL DETAILS</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>		SHT NO.	DESCRIPTION	E0.1	GENERAL NOTES, APPLICABLE CODES AND SHEET INDEX	E0.2	SYMBOLS LIST & ABBREVIATIONS	E0.3	SINGLE LINE DIAGRAM AND PANEL SCHEDULE	E2.1	ELECTRICAL REMODEL FLOOR PLAN	E2.2	ELECTRICAL DEMO ROOF PLAN	E2.3	ELECTRICAL REMODEL ROOF PLAN	E3.1	ELECTRICAL DETAILS						
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		SCOPE OF WORK																									
		THE CONTRACTOR IS TO ACCOMPLISH THE FOLLOWING : THE REPLACEMENT OF 4 ROOFTOP UNITS AND THEIR ASSOCIATED DISCONNECTS SWITCHES AND BREAKERS, THE ADDITION OF A NEW TRANSFORMER AND PANEL TO HANDLE THE LOAD OF THE ADDITION OF 12 CONDENSING UNITS.																									
		APPLICABLE CODES																									
		CODE ANALYSIS THE CONSTRUCTION OF THIS PROJECT SHALL CONFORM TO THE REQUIREMENTS OF: <u>PARTIAL LIST OF APPLICABLE CODES</u> THE CONSTRUCTION OF THIS PROJECT SHALL CONFORM TO THE REQUIREMENTS OF: 2019 BUILDING STANDARDS ADMINISTRATIVE CODE, PART 1, TITLE 24 C.C.R. 2019 CALIFORNIA BUILDING CODE (CBC), PART 2, TITLE 24 C.C.R. 2019 CALIFORNIA ELECTRICAL CODE (CEC), PART 3, TITLE 24 C.C.R. 2019 CALIFORNIA MECHANICAL CODE (CMC), PART 4, TITLE 24 C.C.R. 2019 CALIFORNIA PLUMBING CODE (CPC), PART 5, TITLE 24 C.C.R. 2019 CALIFORNIA ENERGY CODE (TITLE 24, PART 6) 2019 CALIFORNIA REFERENCED STANDARDS CODE - CCR, TITLE 24, PART 12 2016 CALIFORNIA PUBLIC SAFETY - CCR, TITLE 19, DIVISION 1 - STATE FIRE MARSHAL <u>PARTIAL LIST OF STANDARDS, APPLICABLE AS NEEDED</u> (WITH CALIFORNIA AMENDMENTS AS APPLICABLE) 2019 NFPA 13 AUTOMATIC SPRINKLER SYSTEMS 2019 NFPA 101 LIFE SAFETY CODES 2019 NFPA 110 EMERGENCY & STANDBY POWER SYSTEMS 2019 NFPA 72 NATIONAL FIRE ALARM CODE																									

SCHOOL EQUIPMENT ANCHORAGE NOTES

MEP COMPONENT ANCHORAGE NOTE

ALL MECHANICAL, PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED AND INSTALLED PER THE DETAILS ON THE DSA APPROVED CONSTRUCTION DOCUMENTS. THE FOLLOWING COMPONENTS SHALL BE ANCHORED OR BRACED TO MEET THE FORCE AND DISPLACEMENT REQUIREMENTS PRESCRIBED IN THE 2019 CBC SECTIONS 1617A.1.18 THROUGH 1617A.1.26 AND ASCE 7-16 CHAPTERS 13, 26, AND 30:

- ALL PERMANENT EQUIPMENT AND COMPONENTS.
- TEMPORARY, MOVABLE OR MOBILE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G. HARD WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS OR WATER. "PERMANENTLY ATTACHED" SHALL INCLUDE ALL ELECTRICAL CONNECTIONS EXCEPT PLUGS FOR 110/220 VOLT RECEPTACLES HAVING A FLEXIBLE CABLE.
- TEMPORARY, MOVABLE OR MOBILE EQUIPMENT WHICH IS HEAVIER THAN 400 POUNDS OR HAS A CENTER OF MASS LOCATED 4 FEET OR MORE ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT IS REQUIRED TO BE RESTRAINED IN A MANNER APPROVED BY DSA.

THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE BUT NEED NOT DEMONSTRATE DESIGN COMPLIANCE WITH THE REFERENCES NOTED ABOVE. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING, AND CONDUIT. FLEXIBLE CONNECTIONS MUST ALLOW MOVEMENT IN BOTH TRANSVERSE AND LONGITUDINAL DIRECTIONS:

- COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVING A CENTER OF MASS LOCATED 4 FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT.
- COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.

THE ANCHORAGE OF ALL MECHANICAL, ELECTRICAL AND PLUMBING COMPONENTS SHALL BE SUBJECT TO THE APPROVAL OF THE DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE OR STRUCTURAL ENGINEER DELEGATED RESPONSIBILITY AND ACCEPTANCE BY DSA. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH THE ABOVE REQUIREMENTS.

PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEM BRACING NOTE

PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN ASCE 7-16 SECTION 13.3 AS DEFINED IN ASCE 7-16 SECTIONS 13.6.5, 13.6.6, 13.6.7, 13.6.8, AND 2019 CBC, SECTIONS 1617A.1.24, 1617A.1.25 AND 1617A.1.26.

THE METHOD OF SHOWING BRACING AND ATTACHMENTS TO THE STRUCTURE FOR THE IDENTIFIED DISTRIBUTION SYSTEM ARE AS NOTED BELOW. WHEN BRACING AND ATTACHMENTS ARE BASED ON A PRE-APPROVED INSTALLATION GUIDE (E.G., OSHPD OPM FOR 2013 CBC OR LATER), COPIES OF THE BRACING SYSTEM INSTALLATION GUIDE OR MANUAL SHALL BE AVAILABLE ON THE JOBSITE PRIOR TO THE START OF AND DURING THE HANGING AND BRACING OF THE DISTRIBUTION SYSTEMS. THE STRUCTURAL ENGINEER OF RECORD SHALL VERIFY THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE HANGER AND BRACE LOADS.

MECHANICAL PIPING (MP), MECHANICAL DUCTS (MD), PLUMBING PIPING (PP), ELECTRICAL DISTRIBUTION SYSTEMS (E):
MP ☐ MD ☐ PP ☐ E ☐ - OPTION 1: DETAILED ON APPROVED DRAWINGS WITH PROJECT SPECIFIC NOTES AND DETAILS.

MP ☐ MD ☐ PP ☐ E ☐ - OPTION 2: SHALL COMPLY WITH THE APPLICABLE OSHPD PRE-APPROVAL (OPM #) #_____.

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BONITA UNIFIED SCHOOL DISTRICT

PROJECT:

BONITA H.S. GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

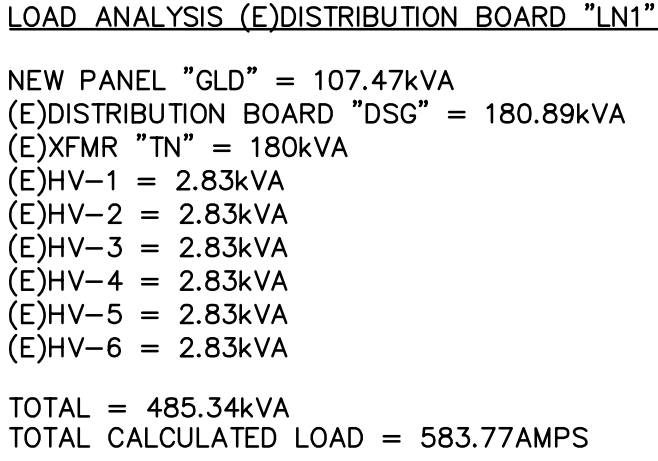
REVISION: DATE: _____

DRAWING TITLE:

GENERAL NOTES, APPLICABLE CODES & SHEET INDEX

DRAWING NO.:

E0.1



NTS

MOUNTING: SURFACE				(E)PANEL--GLC										LOCATION:MAIN ELECT ROOM			
VOLTAGE: 120/208V, 3Ø, 4W				NORMAL BRANCH 10,000 AIC SYM										100 AMP BUS MAIN LUGS ONLY			
DESCRIPTION		VOLT--AMPERES ØA ØB ØC									VOLT--AMPERES ØA ØB ØC			DESCRIPTION			
EXIST. PWR EXTEND	320				1	20	1	2	20	1			1000		EXIST. PA RACK		
EXIST. VOICE EVAC		500			1	20	3	4	20	1			800		EXIST. IDF-G		
EXIST. SEC. SYS.			800		1	20	3	6	20	1				300	EXIST. TV AMP.		
EXIST. INRG. CNTRL	180				1	20	7	8	20	1			180		EXIST. AV CLG. REC		
EXIST. LTC. CNTRL	PNL 500				1	20	9	10	20	1			180		EXIST. AV CLG. REC		
EXIST. EMS			180		1	20	11	12	20	1			180	180	EXIST. AV CLG. REC		
EXIST. REC	540				1	20	13	14	20	1			180		EXIST. AV CLG. REC		
EXIST. 50A REC		3200			2	50	15	16	20	1			180		EXIST. FLR REC-CRT		
-			3200		-	-	17	18	20	1				180	EXIST. FLR REC-CRT		
EXIST. 50A REC	3200				2	50	19	20	20	1			400		EXIST. EXHT FANS		
-					-	-	21	22	20	1				400	EXIST. EXHT FANS		
SPACE					1	20	23	24	20	1				400	EXIST. EXHT FANS		
SPACE					1	20	25	26	20	1			540		EXIST. EXHT FANS		
EXISTING LOAD	180				1	20	27	28	20	1				400	EXIST. EXHT FANS		
EXISTING LOAD		100			1	20	29	30	20	1				400	EXIST. EXHT FANS		
1 AHU CONTROLS	180				1	1	20	31	32	20	1		180		EXIST. REC		
1 AHU LTG		100			1	1	20	33	34	20	1		180		EXIST. REC		
1 VFD-1			1920		1	1	20	35	36	20	1	1		100	AHU LTG		
1 VFD-2			1920		1	1	20	37	38	20	1	1	180		AHU CONTROLS		
1 VFD-3			1920		1	1	20	39	40	20	1				SPACE		
1 VFD-CONTROLS			180		1	1	20	41	42	20	1				SPACE		
VA PER PHASE 6340 6406 380												2660 2140 1560 VA PER PHASE					
CONTINUOUS LOAD 280 x 1.25 = 350 VA												9000 8540 7940 TOTAL VA PER PHASE					
+ OTHER = 2520 VA												25480 TOTAL CONNECTED VA					
TOTAL LOAD = 25550 VA												NOTES					
CEILING OUTLETS = 2												1 NEW C.B. TO MATCH EXISTING					
CONV. OUTLETS = 5												2					
MISC. OUTLETS = 6												3					
THIS PANEL IS FED BY:GLA												4					

- 1 REMOVE EXISTING CIRCUIT BREAKER AND REPLACE WITH NEW. SIZE AS SHOWN ON ONE LINE.
- 2 REMOVE (3)20A/1P BREAKERS AND REPLACE WITH NEW 225A/3P BREAKER AS SHOWN ON SINGLE LINE DIAGRAM.

9

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ARCHITECTS STAMP

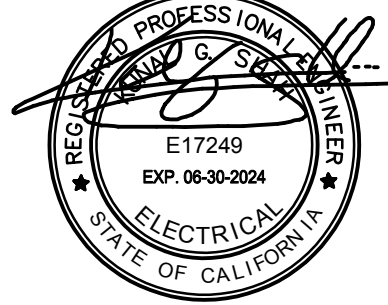


CONSULTANT:



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CONSULTANTS STAMP:



SCHOOL DISTRICT:

BONITA UNIFIED
SCHOOL
DISTRICT

PROJECT:

BONITA H.S. GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE:REVISION: $\triangle 2$ DATE:

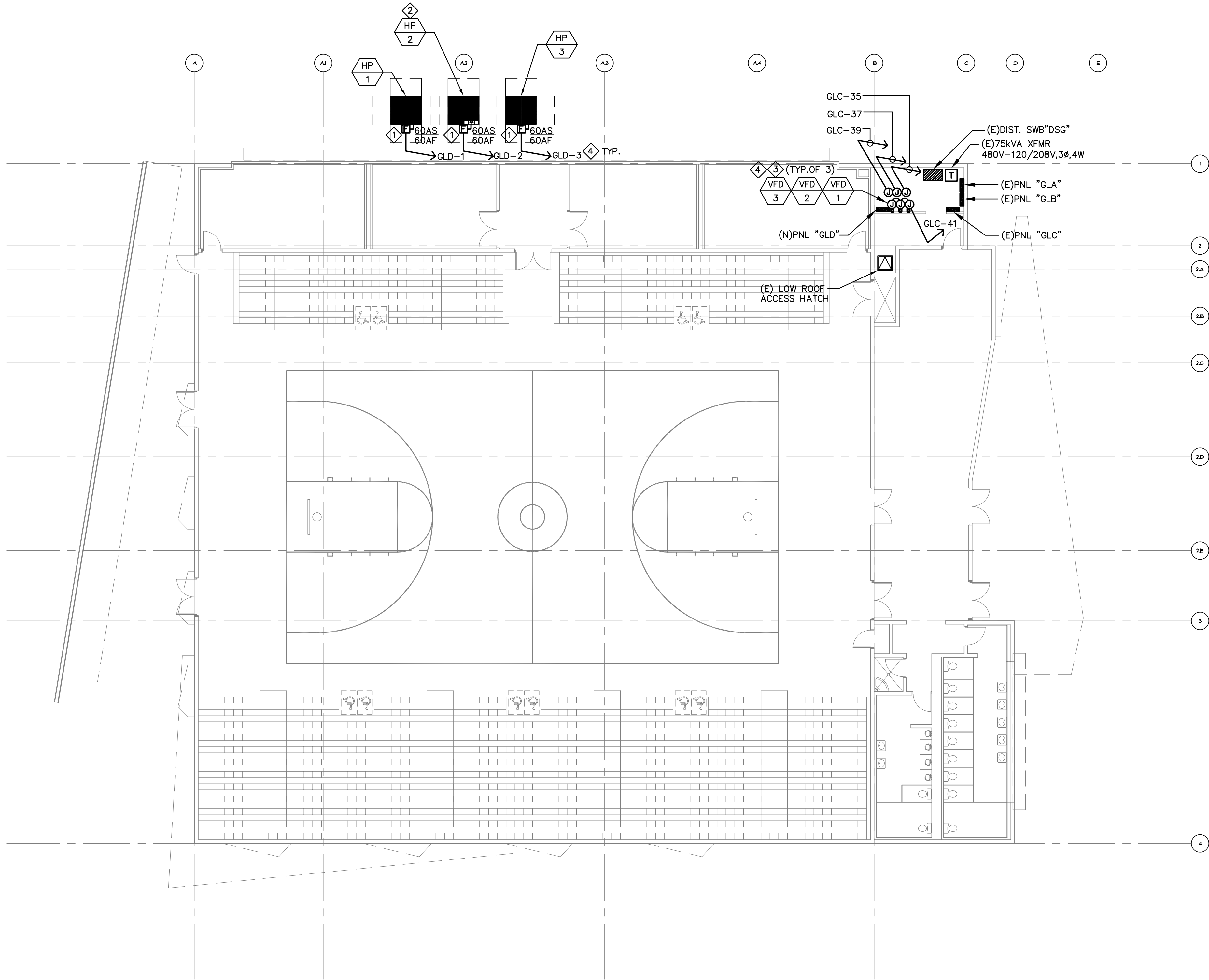
DRAWING TITLE:

SINGLE LINE DIAGRAM & PANEL SCHEDULE

DRAWING NO.:

E0.3

P:\P-2021\2021-190-00 BUSD Bonita HS-Cym HVAC Upgrade\10_BIM-CAD\MEP\E2.1.dwg 9/20/2022 8:56 AM Charles Cruz



ELECTRICAL REMODEL FLOOR PLAN

SCALE:
3/32"=1'-0"

1

GENERAL NOTES

1. OPENING AROUND ELECTRICAL PENETRATION THROUGH FIRE RESISTANCE RATED WALL, PARTITIONS, FLOORS, OR CEILINGS SHALL BE FIRE STOPPED USING APPROVED METHODS TO MAINTAIN FIRE RESISTANCE RATING.
2. CONTRACTOR SHALL FURNISH AND INSTALL EXPANSION FITTINGS AT ALL EXPANSION JOINTS.
3. CONTRACTOR TO FIELD VERIFY AND COORDINATE WITH OWNER EXACT CONDUIT ROUTING PRIOR TO START OF ANY WORK.
4. REFER TO MECHANICAL PLANS FOR THE EXACT LOCATION OF ALL HVAC EQUIPMENT.

REMODEL KEY NOTES

1. PROVIDE NEW FUSED DISCONNECT SWITCH AND NEW CONDUIT AND WIRING AS SHOWN ON SHEET E0.3 SINGLE LINE DIAGRAM.
2. A CONVENIENCE OUTLET IS PROVIDED FOR THIS HEAT PUMP UNIT AND IS POWERED ON THE SAME CIRCUIT USED FOR THE HEAT PUMPS MAIN POWER SUPPLY.
3. PROVIDE A 24V TRANSFORMER AND 120V CONTROLS FOR ALL VFD'S PER MANUFACTURER RECOMMENDATIONS.
4. CONTRACTOR TO FIELD VERIFY AND COORDINATE WITH OWNER EXACT CONDUIT ROUTING PRIOR TO START OF ANY WORK.

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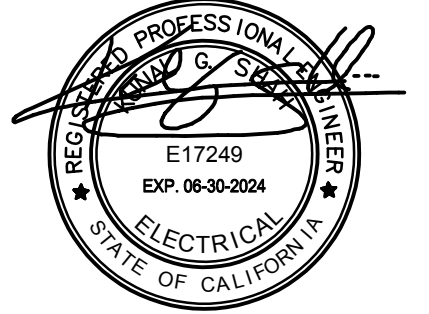


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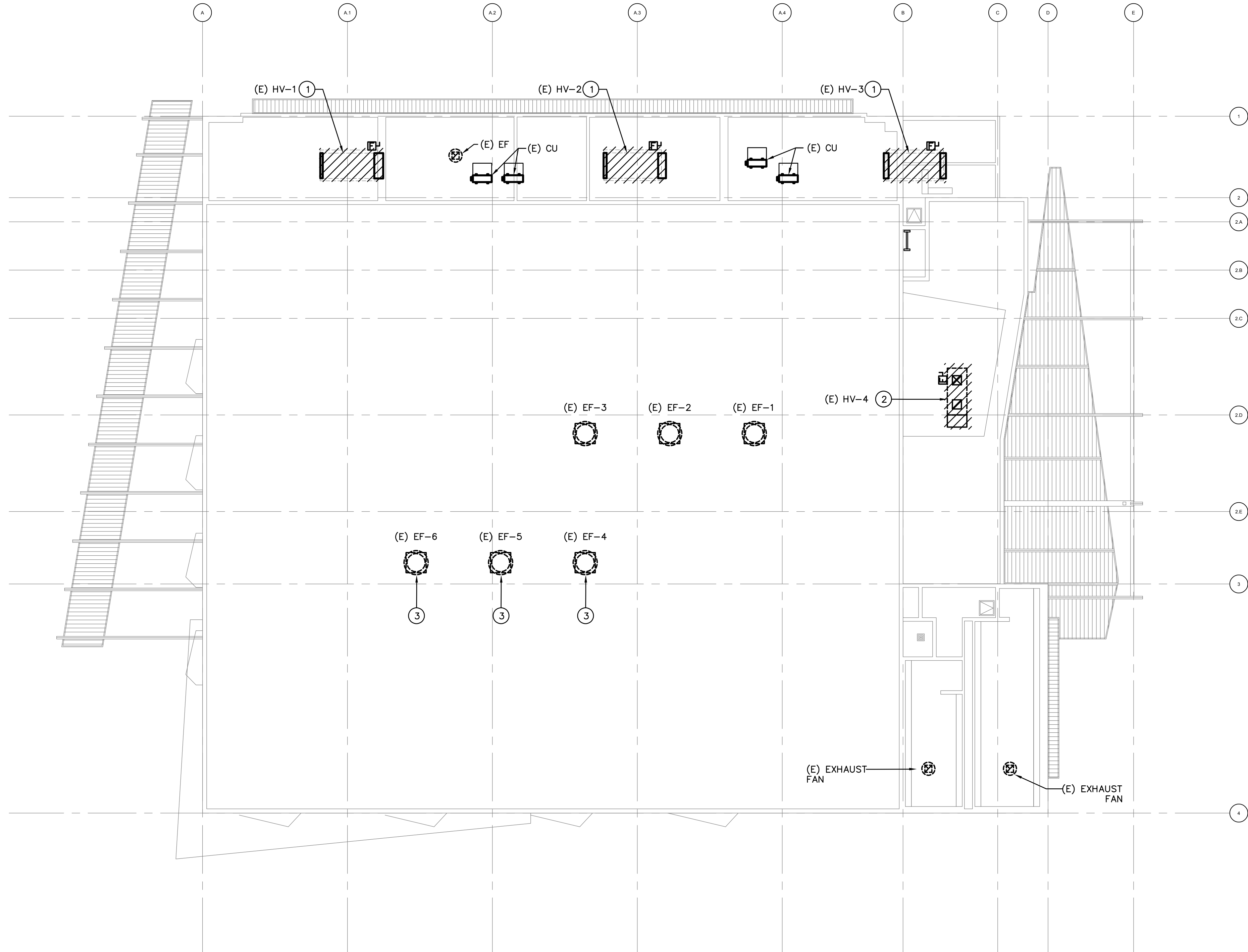
DRAWING TITLE:

ELECTRICAL
REMODEL
FLOOR PLAN

DRAWING NO.:

E2.1

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ELECTRICAL DEMO ROOF PLAN

SCALE:
3/32"=1'-0"

1

GENERAL NOTES

1. CONTRACTOR TO FIELD VERIFY THE EXACT LOCATIONS OF MECHANICAL EQUIPMENT AND CONTROLS.
2. COORDINATE DEMOLITION WORK WITH ALL RELATED DISCIPLINES INCLUDING MECHANICAL.
3. REFER TO DEMOLITION NOTES ON SHEET E0.02 FOR ADDITIONAL INFORMATION.
4. DEMOLITION PLANS ARE DETERMINED FROM MOST CURRENT AS-BUILT DOCUMENTS AVAILABLE. CONTRACTOR TO FIELD VERIFY SITE CONDITIONS PRIOR TO BID.

DEMO KEY NOTES

- ① MECHANICAL CONTRACTOR TO REMOVE UNIT. ELECTRICAL CONTRACTOR IS TO REMOVE DISCONNECT SWITCH AND ALL CONDUIT AND WIRING.
- ② MECHANICAL CONTRACTOR TO REMOVE UNIT. ELECTRICAL CONTRACTOR IS TO REMOVE DISCONNECT SWITCH. CONDUIT AND WIRING SHALL REMAIN.
- ③ CONTRACTOR TO REMOVE ALL CONDUIT AND WIRING BACK TO THE EXISTING EXHAUST FAN AND MARK CIRCUIT BREAKER AS SPARE.

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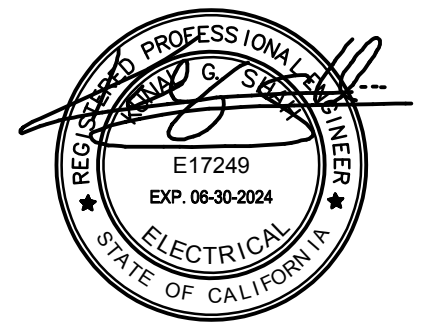
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PROJECT:

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GYMNASIUM

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REVISION: DATE: _____

REVISION: DATE: _____

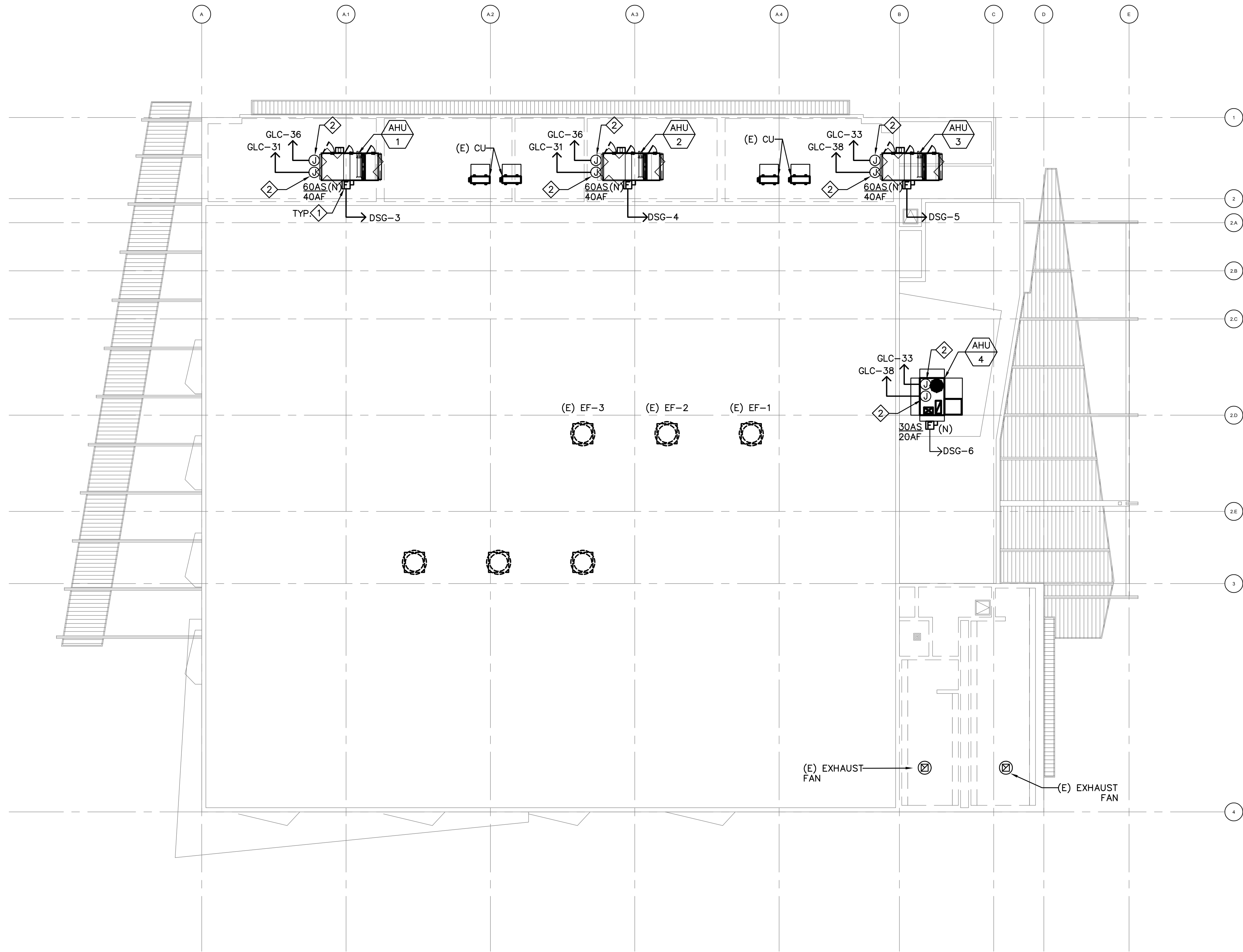
DRAWING TITLE:

ELECTRICAL
DEMO
ROOF PLAN

DRAWING NO.:

E2.2

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GENERAL NOTES

1. OPENING AROUND ELECTRICAL PENETRATION THROUGH FIRE RESISTANCE RATED WALL, PARTITIONS, FLOORS, OR CEILINGS SHALL BE FIRE STOPPED USING APPROVED METHODS TO MAINTAIN FIRE RESISTANCE RATING.
2. CONTRACTOR SHALL FURNISH AND INSTALL EXPANSION FITTINGS AT ALL EXPANSION JOINTS.
3. CONTRACTOR TO FIELD VERIFY AND COORDINATE WITH OWNER EXACT CONDUIT ROUTING PRIOR TO START OF ANY WORK.
4. REFER TO MECHANICAL PLANS FOR THE EXACT LOCATION OF ALL HVAC EQUIPMENT.

REMODEL KEY NOTES

1. PROVIDE NEW FUSED DISCONNECT SWITCH AND NEW CONDUIT AND WIRING AS SHOWN ON ONE LINE DIAGRAM.
2. PROVIDE A 24V TRANSFORMER AND A 120V AHU CIRCUIT FOR CONTROLS AND ANOTHER FOR LIGHTING PER MANUFACTURER RECOMMENDATIONS.

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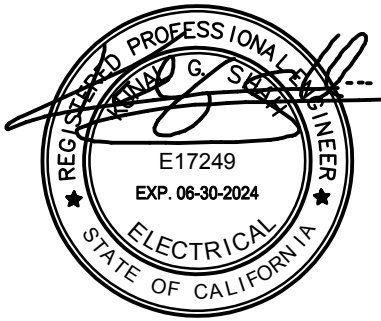


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REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

ELECTRICAL
REMODEL
ROOF PLAN

DRAWING NO.:

E2.3

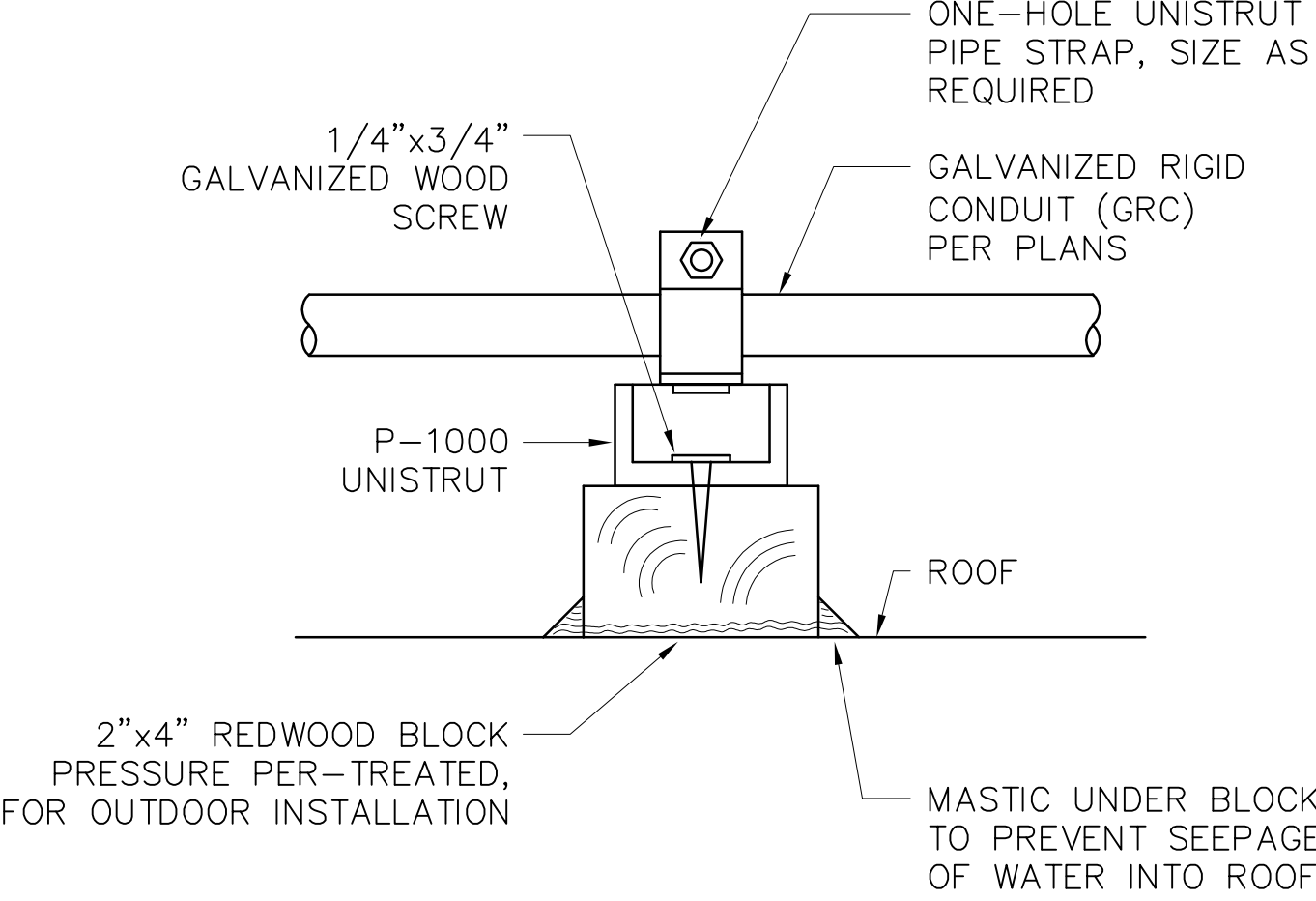
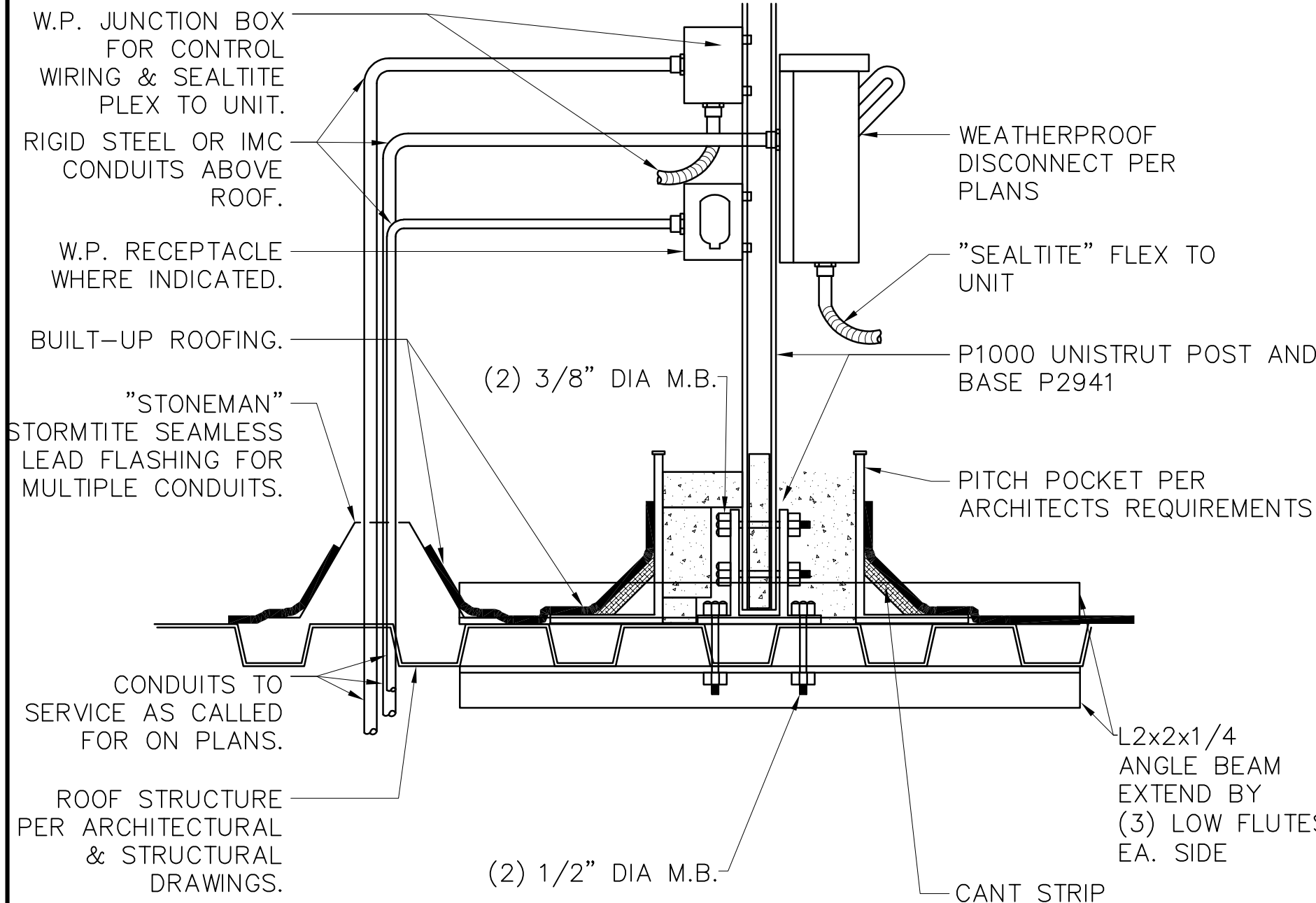
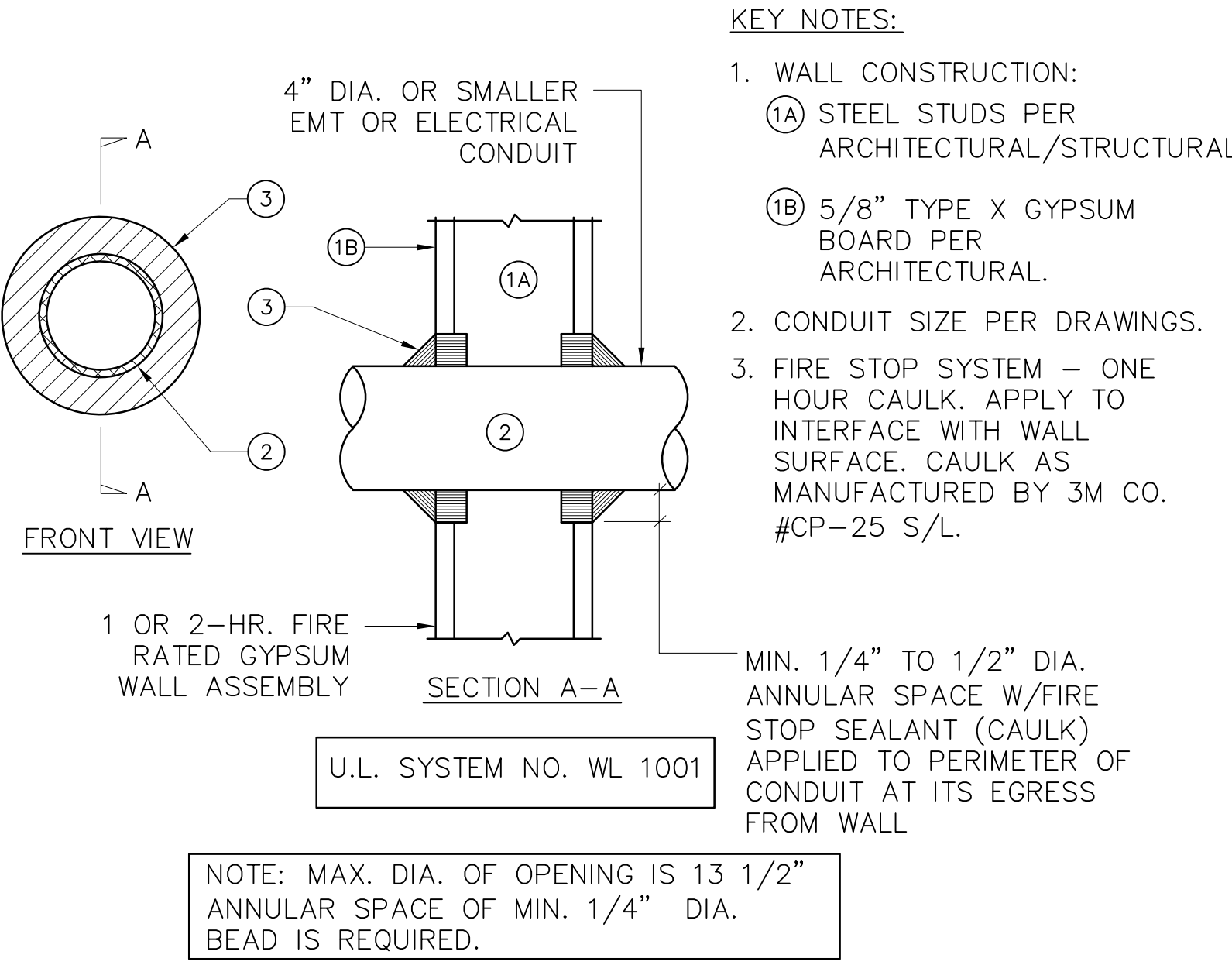
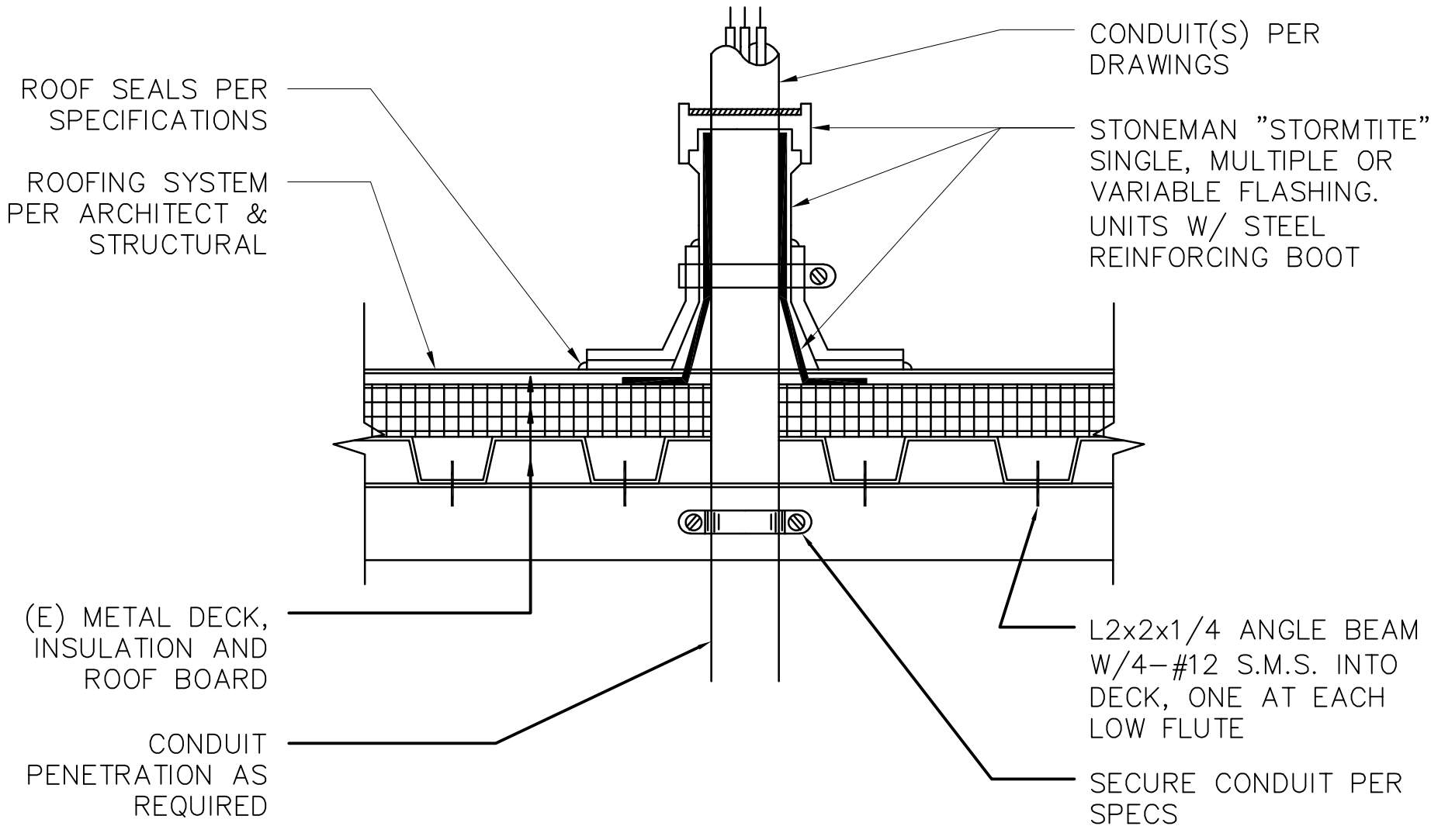
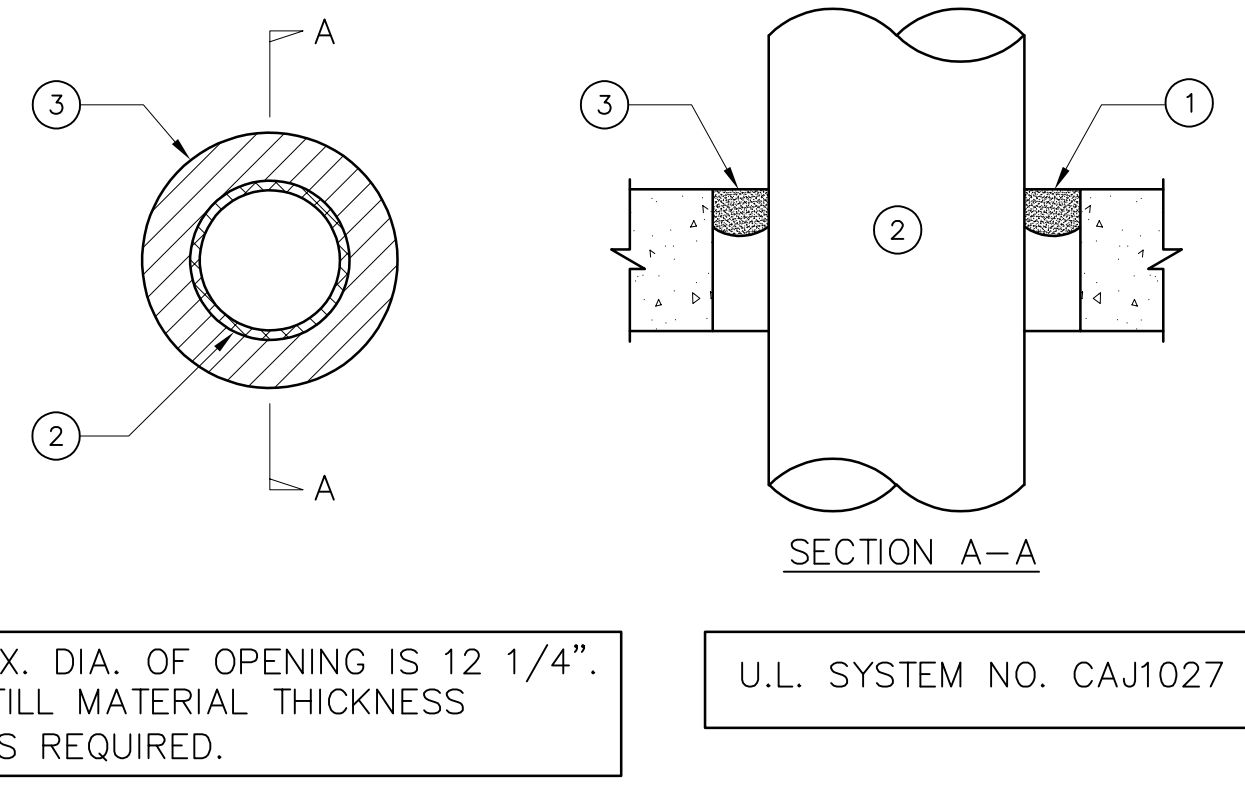
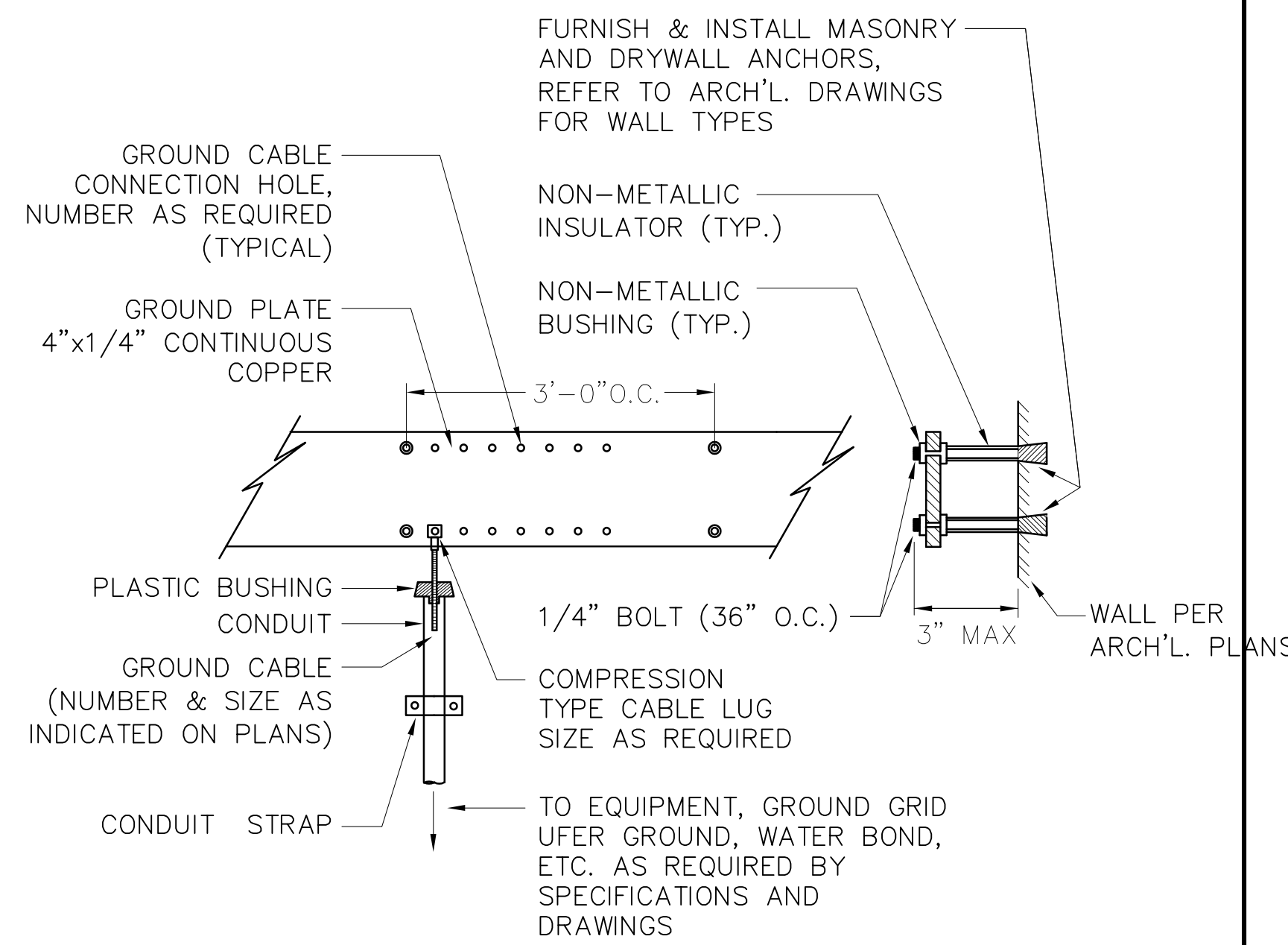


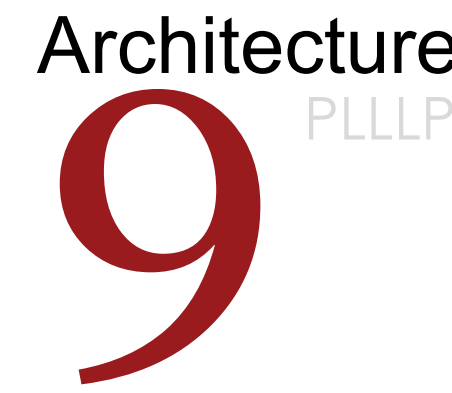
ELECTRICAL REMODEL ROOF PLAN

SCALE:
3/32"=1'-0"

1

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NOT USED	NOT TO SCALE	7	CONDUIT SUPPORT ON ROOF DETAIL	NOT TO SCALE	4	NOT USED	NOT TO SCALE	1
								
A/C DISCONNECT MOUNTING DETAIL	NOT TO SCALE	8	CONDUIT PENETRATION THRU 1-HOUR FIRE/SMOKE WALL DETAIL	NOT TO SCALE	5	CONDUIT ROOF PENETRATION DETAIL	NOT TO SCALE	2
								
CONDUIT PENETRATION THRU 2-HOUR CONCRETE FLOOR/WALL DETAIL	NOT TO SCALE	6	GROUND BUS MOUNTING DETAIL	NOT TO SCALE	3			



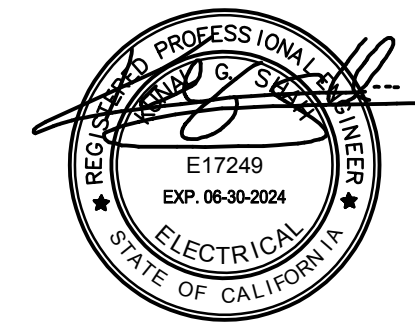
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JOB NUMBER:

DATE: 2022-01-14

REVISION: A

DATE:

REVISION: B

DATE:

DRAWING TITLE:

ELECTRICAL
DETAILS






DRAWING NO.:

E3.1

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SEQUENCE OF OPERATION						
DEVICE ACTION	MANUAL PULL STATION	AREA SMOKE/ HEAT DETECTOR	SPRINKLER WATER FLOW SWITCH	SPRINKLER VALVE TAMPER SWITCH	120VAC POWER FAILURE	
ANNUNCIATE AT FACP AND REMOTE ANNUNCIATOR	✕	✕	✕			
ANNUNCIATE SUPERVISORY CONDITION AT FACP AND REMOTE ANNUNCIATOR				✕		
ANNUNCIATE TROUBLE AT FACP AND REMOTE ANNUNCIATOR*	✕	✕	✕	✕	✕	
ACTIVATE AUDIBLE/VISUAL ALARM SIGNAL THROUGHOUT SCHOOL (ALARM)	✕	✕	✕			
CONTACT CENTRAL STATION (UDACT)	✕	✕	✕	✕	✕	
SHUT DOWN AC UNITS (FOR AREA IN ALARM)		✕	✕			
CLOSE SMOKE/FIRE DAMPER (FOR AREA IN ALARM)		✕	✕			
SOUND SPRINKLER BELL			✕			
MUTE LOCAL PA SYSTEM	✕	✕	✕			

NOTE:
REFER TO REFERENCED DSA APPROVED DRAWINGS A#03-113305 FOR THE EXISTING RISER DIAGRAM AND THE EXISTING BATTERY CALCULATIONS. NO NEW LOAD IS ADDED TO THE EXISTING CIRCUITS.

FIRE ALARM SYMBOL LIST					
SYMBOL	MFG.	PART NO.	DESCRIPTION	MNTG. HEIGHT/ DETAILS	CSFM LISTING NO.
	GAMEWELL	E3-SERIES	(E) FIRE ALARM CONTROL PANEL		EXISTING
	HONEYWELL	MP-24S6	(E) REMOTE POWER SUPPLY		EXISTING
	GAMEWELL	ASD-PTL2F	(E) PHOTO SMOKE DETECTOR		7272-1703.0121
	SYSTEM SENSOR	B210LP	(E) STANDARD BASE		7300-1653.0109
	GAMEWELL	AMM-2F	(E) & (N) MONITOR MODULE	WALL /CEILING MOUNTED	7300-1703.0102
	GAMEWELL	AOM-2SF	(E) & (N) CONTROL MODULE	WALL /CEILING MOUNTED	7300-1703.0102

DSA NOTES, STANDARDS AND GUIDES						
<div>1. ALL WIRING SHALL BE INSTALLED IN ACCORDANCE WITH C.E.C. ARTICLE 760, POWER LIMITED FIRE PROTECTIVE SIGNALING CIRCUITS.</div> <div>2. FIRE ALARM DEVICES SHALL BE INSTALLED PER N.F.P.A. 72, 2016 EDITION.</div> <div>3. FIRE ALARM SYSTEM SHALL BE CONNECTED TO DEDICATED POWER SUPPLY WITH CIRCUIT BREAKER WITH LOCK-ON DEVICE AND SHALL INCORPORATE INTERNAL RECHARGEABLE BATTERIES TO PROVIDE A STAND-BY OPERATION (100% OF APPLICABLE COMPONENTS FOR 24 HOURS) AND ALARM OPERATION (100% OF APPLICABLE COMPONENTS FOR 5 MINUTES; 15 MINUTES FOR EVAC) AFTER 24 HOURS OF STANDBY OPERATION IN ACCORDANCE WITH N.F.P.A. CHAPTER 10, 2016 EDITION.</div> <div>4. ALL WIRING, ANNUNCIATING DEVICES AND ANNUNCIATOR PANEL SHALL BE SUPERVISED AT THE PRINCIPAL POINT OF ANNUNCIATION. (FIA PANEL TO SUPERVISE ALL CIRCUITS AND INITIATING DEVICES)</div> <div>5. POINT AND COMMON ANNUNCIATION AND T-TAPPING IS PROHIBITED.</div> <div>6. PROVIDE ALL NECESSARY BACK BOXES FOR FIA DEVICES, TYPE 45 OR AS REQUIRED.</div> <div>7. VERTICAL RUNS OF FIRE ALARM SYSTEM CONDUCTORS AND CABLES SHALL BE ENCLOSED IN METAL RACEWAYS.</div> <div>8. UPON COMPLETION OF THE INSTALLATION OF THE FIRE ALARM SYSTEM, A SATISFACTORY TEST OF THE ENTIRE SYSTEM SHALL BE MADE IN THE PRESENCE OF THE DSA-CERTIFIED PROJECT INSPECTOR.</div> <div>9. A STAMPED SET OF APPROVED FIRE ALARM PLANS SHALL BE ON THE JOB SITE AND USED FOR INSTALLATION.</div> <div>10. ANY DEVIATION FROM APPROVED PLANS, INCLUDING THE SUBMITTAL OF DEVICES, SHALL BE APPROVED BY THE DSA.</div> <div>11. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE CODE OF RECOGNIZED STANDARDS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.</div> <div>12. ALL DEVICES ON THE FIRE ALARM SYSTEM SHALL BE APPROVED AND LISTED BY THE CALIFORNIA STATE FIRE MARSHAL.</div> <div>13. CERTIFICATE OF COMPLIANCE SHALL BE SUBMITTED TO THE DSA. AN ACCEPTABLE TEST WITNESSED BY THE DSA SHALL BE PERFORMED PRIOR TO FINAL APPROVAL PER NFPA 72 2016 CHAPTER 14.4.1.1 TESTING.</div> <div>14. ALL CONDUCTORS SHALL BE POWER LIMITED COPPER AND INSTALLED WITHIN A METALLIC RACEWAY. CONDUITS SHALL BE A MINIMUM SIZE OF 3/4".</div> <div>15. SEAL ALL CONDUIT PENETRATIONS THROUGH THE FIRE RATED WALLS AND FLOORS WITH APPROVED SAME RATING FIRE RATED CAULK.</div> <div>16. PROVIDE SUPPORT FOR ALL CONDUITS AND VERTICAL WIRING AS REQUIRED BY N.E.C.</div> <div>17. REFER TO FIRE ALARM SPECS FOR MANUFACTURERS CUT SHEETS AND CALIFORNIA STATE FIRE MARSHAL LISTINGS.</div> <div>18. UPON COMPLETION OF THE INSTALLATION A SATISFACTORY TEST OF THE ENTIRE SYSTEM SHALL BE MADE IN THE PRESENCE OF THE ENFORCING AGENCY.</div> <div>19. THE FIRE ALARM SYSTEM SHALL CONFORM TO THE C.E.C. ARTICLE 760, DEVICES SHALL BE INSTALLED PER 2016 NFPA 72. PROVIDE ALL WIRING BY THE ELECTRICAL CONTRACTOR.</div> <div>20. WIRING SHALL NOT BE LOOPED THROUGH DEVICES; WIRE MUST BE CUT FOR IN AND OUT.</div> <div>21. ALL DEVICES IN THE ALARM SYSTEM SHALL BE COMPATIBLE AND INSTALLED TO MANUFACTURERS SPECIFICATIONS.</div> <div>22. AREAS HAVING MORE THAN 2 STROBES IN THE FIELD OF VIEW SHALL BE SYNCHRONIZED.</div> <div>23. SMOKE DETECTORS AND HEAT DETECTOR LOCATIONS ARE BASED ON SMOOTH CEILING WITH MAXIMUM HEIGHT OF 10 FEET UNLESS OTHERWISE NOTED.</div> <div>24. STROBE LOCATION IS BASED ON 10 FOOT CEILING HEIGHT AND ARE INSTALLED ACCORDING TO NFPA 72, 2016 EDITION REQUIREMENTS UNLESS OTHERWISE NOTED.</div> <div>25. WALL-MOUNTED STROBES SHALL HAVE THEIR BOTTOM LEN NOT LESS THAN 80 INCHES ABOVE FINISHED FLOOR AND NO GREATER THAN 96 INCHES TO THE TOP OF THE LENS ABOVE FINISHED FLOOR.</div> <div>26. TOP OF PULL STATIONS SHALL BE MOUNTED AT 48" ABOVE FLOOR LEVEL.</div> <div>27. ALL FIRE ALARM DEVICES ON THE CAMPUS SHALL BE SYNCHRONIZED.</div> <div>28. ALL FIRE ALARM CIRCUITS SHALL BE LABELED AT CONNECTIONS AND AT JUNCTION BOXES. ALL CONCEALED CONDUIT, JUNCTION BOXES AND COVERS SHALL BE RED IN COLOR. ALL CONDUIT SHALL BE CONCEALED WHERE POSSIBLE. ALL EXPOSED CONDUITS SHALL NOT BE RED AND SHALL BE WIREMOLD 700 OR EQUAL.</div> <div>29. FIRE ALARM DRAWINGS ARE SCHEMATIC IN NATURE ONLY. CONTRACTOR TO ROUTE CONDUIT AS FIELD CONDITIONS INDICATE.</div> <div>30. CONDUIT AND JUNCTION/BACK BOXES ARE NOT TO BE USED FOR UNRELATED WIRING. ALL WIRING SHALL BE IN CONDUIT. ALL CONDUIT SIZES INDICATED IN DRAWINGS ARE MINIMUM.</div> <div>31. FIRE ALARM SYSTEM SHALL BE INSTALLED BY FACTORY NOTIFIER OR APPROVED EQUAL AUTHORIZED REPRESENTATIVE.</div> <div>32. PER CFC 901.5.1: OCCUPANCY TO ANY PORTION OF BUILDING/STRUCTURE PROHIBITED UNTIL THE REQUIRED SYSTEM IS INSTALL AND CERTIFIED.</div> <div>33. PER CFC 907.8.4: SMOKE DETECTOR(S) SHALL BE TESTED BY MANUFACTURER'S CALIBRATED SENSITIVITY TEST METHOD. SENSITIVITY TEST INSTRUMENT OR OTHER CALIBRATED SENSITIVITY TEST METHOD. SENSITIVITY REPORT SHALL REMAIN ON PREMISE WITH RECORD DRAWING.</div> <div>35. VISIBLE DEVICES SHOULD NOT EXCEED TWO FLASHES PER SECOND AND SHOULD NOT BE SLOWER THAN ONE FLASH EVERY SECOND. THE DEVICE SHALL HAVE A PULSING LIGHT SOURCE NOT LESS THAN 15 CANDELLA. VISIBLE DEVICES WITHIN 55' FROM EACH OTHER SHALL BE SYNCHRONIZED.</div> <div>36. CHANGES TO THE APPROVED DRAWINGS AND SPECIFICATIONS SHALL BE MADE BY ADDENDA OR CHANGE ORDERS APPROVED BY THE DIVISION OF THE STATE ARCHITECT, AS REQUIRED BY SECTION 4-338, PART 1, TITLE 24, CCR.</div> <div>37. A "DSA CERTIFIED" PROJECT INSPECTOR EMPLOYED BY THE DISTRICT (OWNER) AND APPROVED BY THE DIVISION OF THE STATE ARCHITECT SHALL PROVIDE CONTINUOUS INSPECTION OF THE WORK. THE DUTIES OF THE INSPECTOR ARE DEFINED IN SECTION 4-342, CALIFORNIA BUILDING STANDARD ADMINISTRATIVE CODE (PART 1, TITLE 24, CCR).</div> <div>38. A DSA INSPECTOR WITH CLASS 2 - RBIP CERTIFICATION IS REQUIRED FOR THIS PROJECT.</div> <div>39. THE INTENT OF THESE DRAWINGS AND SPECIFICATIONS IS THAT THE WORK OF THE ALTERATION, REHABILITATION OR RECONSTRUCTION IS TO BE IN ACCORDANCE WITH TITLE 24, CALIFORNIA CODE OF REGULATIONS. SHOULD ANY EXISTING CONDITIONS SUCH AS DETERIORATION OR NON-COMPLYING CONSTRUCTION BE DISCOVERED WHICH IS NOT COVERED BY THE CONTRACT DOCUMENTS WHEREIN THE FINISHED WORK WILL NOT COMPLY WITH TITLE 24, CALIFORNIA CODE OF REGULATIONS, A CHANGE ORDER, OR A SEPARATE SET OF PLANS AND SPECIFICATION, DETAILING AND SPECIFYING THE REQUIRED WORK SHALL BE SUBMITTED TO AND APPROVED BY THE DIVISION OF THE STATE ARCHITECT BEFORE PROCEEDING WITH THE WORK. (REFERENCE: SECTION 4-317 (c), CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE (PART 1, TITLE 24, CCR))</div> <div>40. AUTOMATIC FIRE ALARM SYSTEMS SHALL TRANSMIT THE ALARM, SUPERVISORY AND TROUBLE SIGNALS TO AN APPROVED SUPERVISING STATION AS REQUIRED BY NFPA 72 AS AMENDED BY ARTICLE 91. THE SUPERVISION STATION SHOULD BE LISTED AS EITHER UJFX OR UJUS BY UNDERWRITERS LABORATORY OR SHALL MEET THE REQUIREMENTS OF FACTORY MUTUAL RESEARCH APPROVAL STANDARD 3011. SUPERVISION OF SYSTEM AND LEASED TELEPHONE LINES SHALL BE ARRANGED BY OWNER.</div> <div>41. PROJECT INSPECTOR SHALL PROVIDE DSA DISTRICT FIELD ENGINEER, OWNER (AOR) & LOCAL FIRE AUTHORITY WITH COPY OF FIRE ALARM RECORD OF COMPLETION.</div> <div>42. AUDIBLE APPLIANCES SHALL PROVIDE 15 dba, ABOVE AMBIENT NOISE LEVELS IN ALL OCCUPIED AREAS.</div> <div>43. CUTTING, BORING, SAW CUTTING, OR DRILLING THROUGH THE NEW OR EXISTING STRUCTURAL ELEMENTS TO BE DONE ONLY WHEN SO DETAILED IN THE DRAWINGS OR ACCEPTED BY THE LAUSD ARCHITECT AND STRUCTURAL ENGINEER WITH DAS APPROVAL</div> <div>44. AN INSPECTOR WHO IS SPECIFICALLY QUALIFIED IN MECHANICAL & ELECTRICAL WORK WILL BE REQUIRED FOR THIS PROJECT.</div> <div>45. CUTTING, BORING, SAW CUTTING, OR DRILLING THROUGH THE NEW OR EXISTING STRUCTURAL MEMBERS ARE TO BE DONE ONLY WHEN SO DETAILED IN THE DRAWINGS, OR ACCEPTED BY THE ARCHITECT AND STRUCTURAL ENGINEER WITH APPROVAL OF DSA.</div>						

SHEET INDEX		
SHT.NO.	DESCRIPTION	
EF0.1	GENERAL NOTES, APPLICABLE CODES AND SHEET INDEX	
EF2.1	FIRE ALARM REMODEL PLAN	
EF3.1	FIRE ALARM DETAILS	
FIRE ALARM WORK SCOPE		
THE CONTRACTOR IS TO ACCOMPLISH THE FOLLOWING :		
1.	PROVIDE NEW FIRE ALARM CONNECTIONS TO EXISTING AREA SMOKE DETECTORS FOR NEW HVAC UNITS SHUTDOWN.	
2.	RE-PROGRAM AND RE-TEST THE (E) FIRE ALARM CONTROL PANEL AND ALL AFFECTED CIRCUITS. UPDATE THE GRAPHIC ANNUNCIATOR TO ACCEPT THE NEW BUILDING.	
CONTRACTOR SUBMITTAL REQUIREMENT		
FIRE ALARM SYSTEM		
1.	EVIDENCE OF QUALIFICATION FOR SYSTEM INSTALLER. CERTIFICATE FROM FIRE ALARM SYSTEM MANUFACTURER INDICATING THE COMPANY IS FACTORY AUTHORIZED AND CERTIFIED TO INSTALL THE FIRE ALARM SYSTEM AS SPECIFIED ON DRAWINGS.	
2.	SITE PLAN SHOWING CONDUIT AND WIRING BETWEEN BUILDINGS.	
3.	FLOOR PLANS SHOWING DEVICES AND WIRING.	
4.	DRAWINGS SHOWING a) RISER DIAGRAM, b) BATTERY AND VOLTAGE DROP CALCULATIONS, c) TYPICAL DEVICE WIRING DIAGRAMS, d) EQUIPMENT AND WIRING LEGEND, e) APPLICABLE CODES REFERENCE f) SEQUENCE OF OPERATION.	
5.	EQUIPMENT CUT SHEETS WITH CSFM LISTING SHEETS.	
6.	GENERAL NOTES.	
ALL OTHER LOW VOLTAGE SYSTEMS		
1.	EVIDENCE OF QUALIFICATION FOR SYSTEM INSTALLER.	
2.	SITE PLAN SHOWING CONDUIT AND WIRING BETWEEN BUILDINGS.	
3.	FLOOR PLANS SHOWING DEVICES AND WIRING.	
4.	DRAWINGS SHOWING a) RISER DIAGRAM/BLOCK DIAGRAMS, b) TYPICAL DEVICES WIRING DIAGRAMS, c) MAJOR EQUIPMENT ELEVATION, d) EQUIPMENT AND WIRING LEGEND, e) CALCULATION (IF REQUIRED).	
5.	EQUIPMENT CUT SHEETS WITH CLEAR IDENTIFICATION.	
6.	BILL OF MATERIALS.	
7.	GENERAL NOTES.	
GENERAL NOTES		
1.	SITE PLAN, FLOOR PLANS, RISER DIAGRAMS, WIRING DIAGRAMS, CALCULATIONS MUST BE SUBMITTED IN AUTO CAD FORMAT. THE CONTRACTOR SHALL COMPLY WITH OWNER'S LABELING FORMAT AND STANDARDS.	
2.	AFTER COMPLETION OF THE PROJECT, THE CONTRACTOR MUST SUBMIT (4) FOUR COPIES OF "AS-BUILT" CONSTRUCTION DRAWINGS WITH PROJECT CLOSING DOCUMENTS INCLUDING TEST REPORT AS REQUIRED PER SPECIFICATION.	
3.	REFER TO ADDITIONAL REQUIREMENT IN RESPECTIVE SYSTEM SPECIFICATION.	
<div>COMPLETE FIRE ALARM SYSTEM APPROVAL REQUESTED SUBMITTAL PER DSA GL 2</div>		
CONDUIT AND WIRE SPECIFICATIONS		
LABEL	DESCRIPTION OF CONTENTS	CONDUIT SIZE (UNO)
F1	(1)-2#16 THHN/THWN STRANDED	3/4" MIN.
F2	(1)-2#14 THHN/THWN STRANDED	3/4" MIN.
NOTES: 1. 2/16 = WESTPENN CABLE #990; INSIDE ONLY. 2. 2/16 = ALLSTAR CABLE #3216B2-S1-0; UNDERGROUND. 3. #12 = GENERAL CABLE; 12AWG THWN STRANDED 4. #16 = GENERAL CABLE; 16AWG THHN STRANDED 5. "THWN", "AQUASEAL", OR EQUAL TO BE USED IN WET LOCATIONS. 6. ALL WIRING TO BE LISTED FOR USE AS REQUIRED BY TITLE 24/CEC, ART. 760. 7. WHERE CONDUIT IS INSTALLED, CONDUIT FILL SHALL COMPLY WITH 2019 NEC FILL TABLE C.1 (BASED ON TABLE 1, CHAPTER 9).		


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ARCHITECTS STAMP:



CONSULTANT:

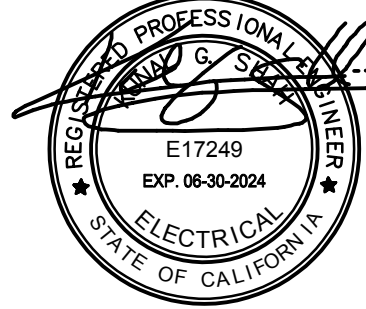


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CONSULTANTS STAMP:



SCHOOL DISTRICT:


BONITA UNIFIED SCHOOL DISTRICT


PROJECT:

BONITA H.S. GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION:  DATE: _____

REVISION:  DATE: _____

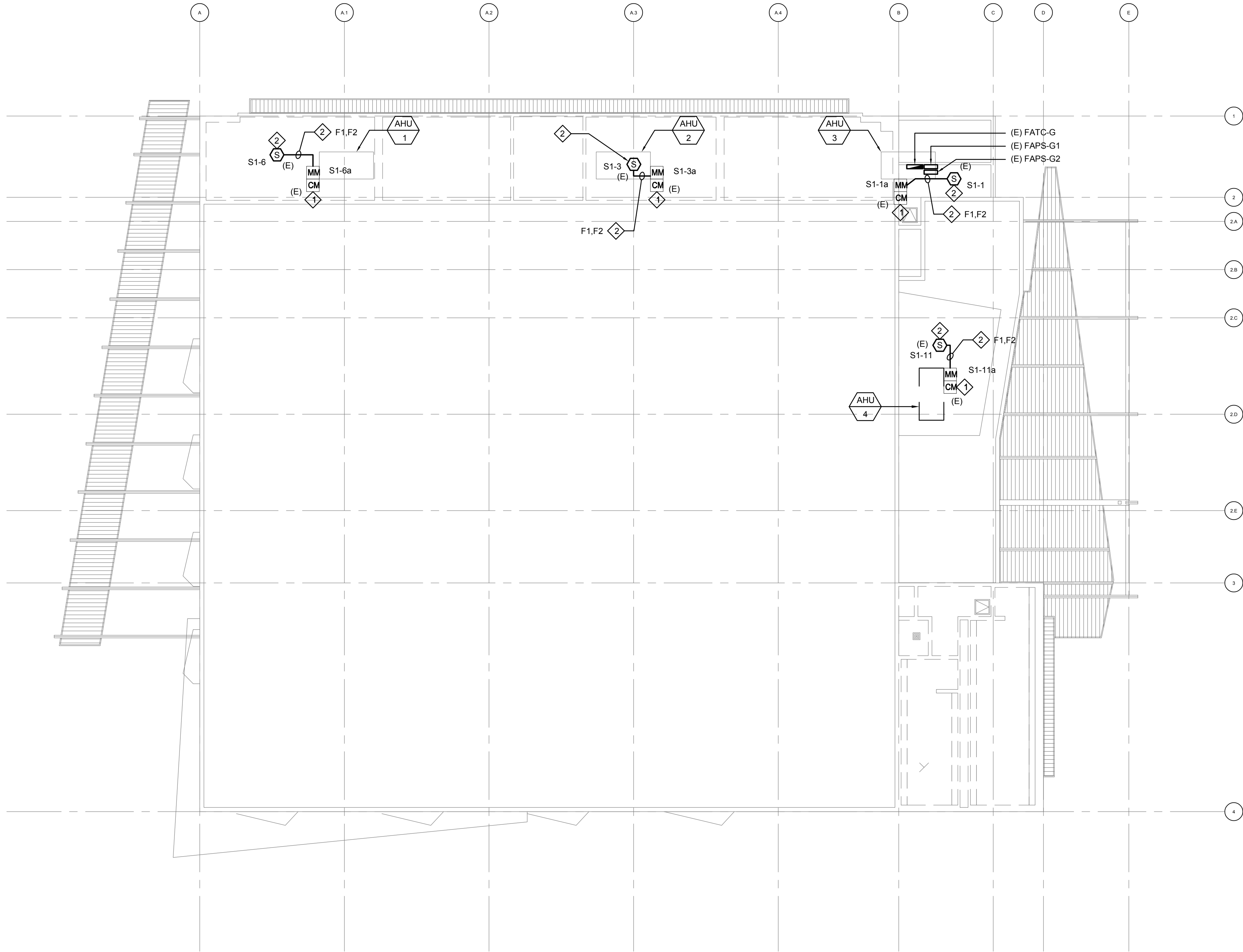
DRAWING TITLE:

GENERAL NOTES, APPLICABLE CODES & SHEET INDEX

DRAWING NO.:

EF0.1

P:\P-2021\2021-190-00 BUSD Bonita HS-Cym HVAC Upgrade\10_BIM-CAD\MEP\EF2.1.dwg 9/20/2022 8:56 AM Charles Cruz



FIRE ALARM REMODEL PLAN

SCALE:
3/32"=1'-0"

1

GENERAL NOTES

1. REFER TO DSA APPROVED DRAWINGS A#03-113305 FOR EXISTING FIRE ALARM RISER.
2. FIRE ALARM SYSTEM DEVICES SHALL BE U.L. AND C.S.F.M. LISTED AND APPROVED.
3. ROUTE CONDUITS CONCEALED WHEREVER POSSIBLE. ROUTE EXPOSED CONDUITS HIGH AND TIGHT TO STRUCTURE AND ROOF DECK. REFER TO SHEET 3.1 FOR CONDUIT SUPPORT AND PENETRATION DETAIL.
4. ALL WIRING SHALL BE IN CONDUIT AND PROVIDE MINIMUM 3/4 INCH CONDUIT.
5. REFER TO MECHANICAL DRAWINGS FOR EXACT EQUIPMENT LOCATIONS.

REMODEL KEY NOTES

1. REPLACE EXISTING CONTROL/MONITOR MODULE WITH NEW AND CONNECT TO NEW HVAC UNIT CONTROLLER FOR AUTOMATIC SHUTOFF PER CMC 608. SEE DETAIL 3/EF3.1. PROVIDE FIRE ALARM CONNECTION FROM EXISTING LOCAL AREA SMOKE DETECTOR. REFER TO DSA APPROVED DRAWINGS A#03-113305 FOR EXISTING FIRE ALARM RISER.
2. EXISTING AREA SMOKE DETECTOR MODEL#ASD-PL2F. EXTEND CONDUIT TO NEW RELAY MODULES AND PROVIDE NEW FA SYSTEM WIRING FOR AIR HANDLING UNIT SHUT DOWN UPON ALARM.

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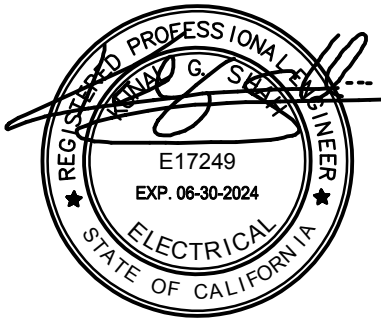


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SCHOOL DISTRICT:

BONITA UNIFIED
SCHOOL
DISTRICT

PROJECT:

BONITA H.S.
GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION:  DATE: _____

REVISION:  DATE: _____

DRAWING TITLE:

FIRE ALARM
REMODEL
PLAN

DRAWING NO.:

EF2.1

P:\P-2021\2021-190-00 BUSD Bonita HS-Gym HVAC Upgrade\10_BIM-CAD\MEP\EF3.1.dwg 9/20/2022 8:56 AM Charles Cruz

NOT USED.

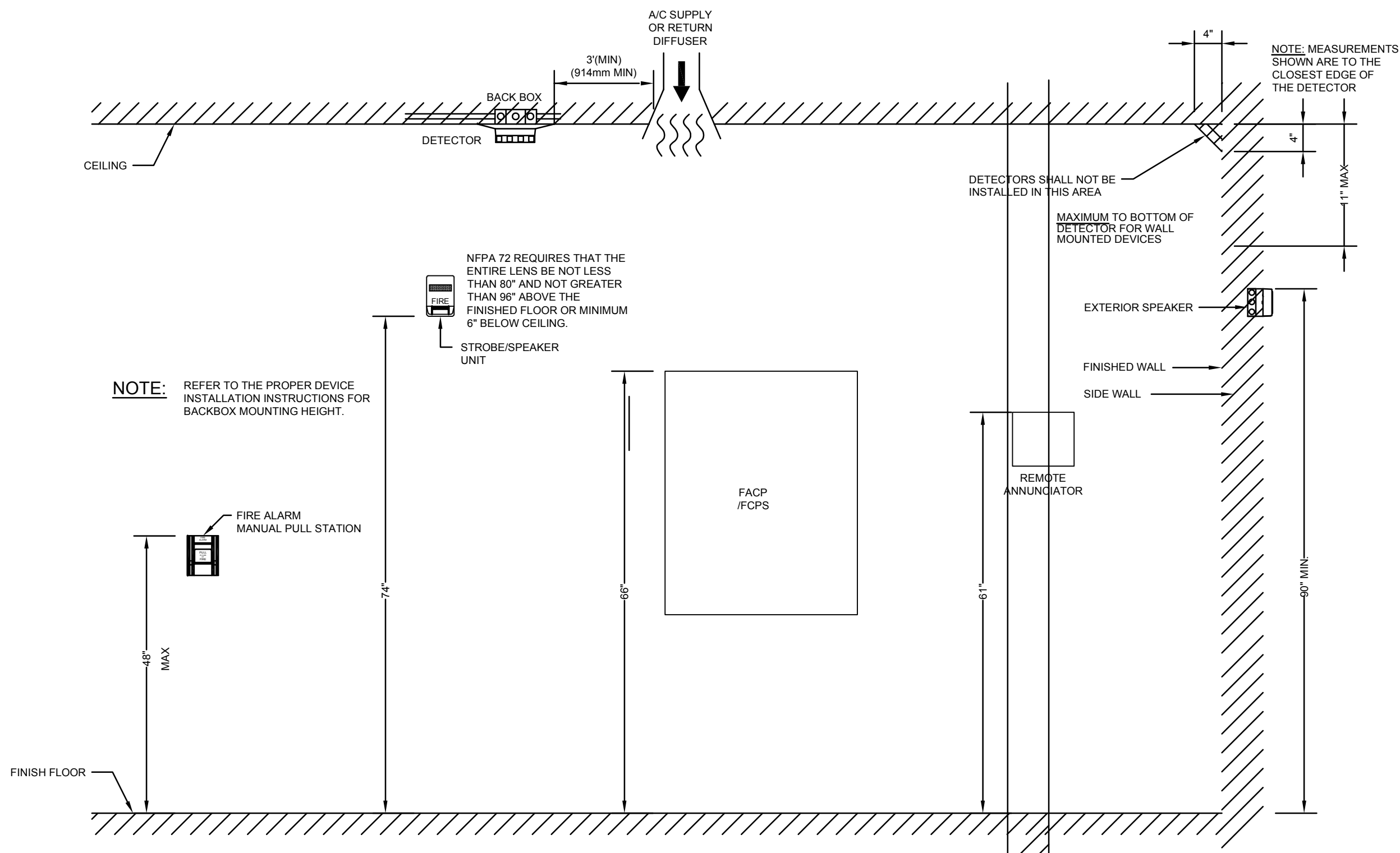
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TYPICAL FACP/FCPS INTERFACING WIRING DIAGRAM

NOT TO SCALE 4

RELAY MODULE WIRING DIAGRAM

NOT TO SCALE 1

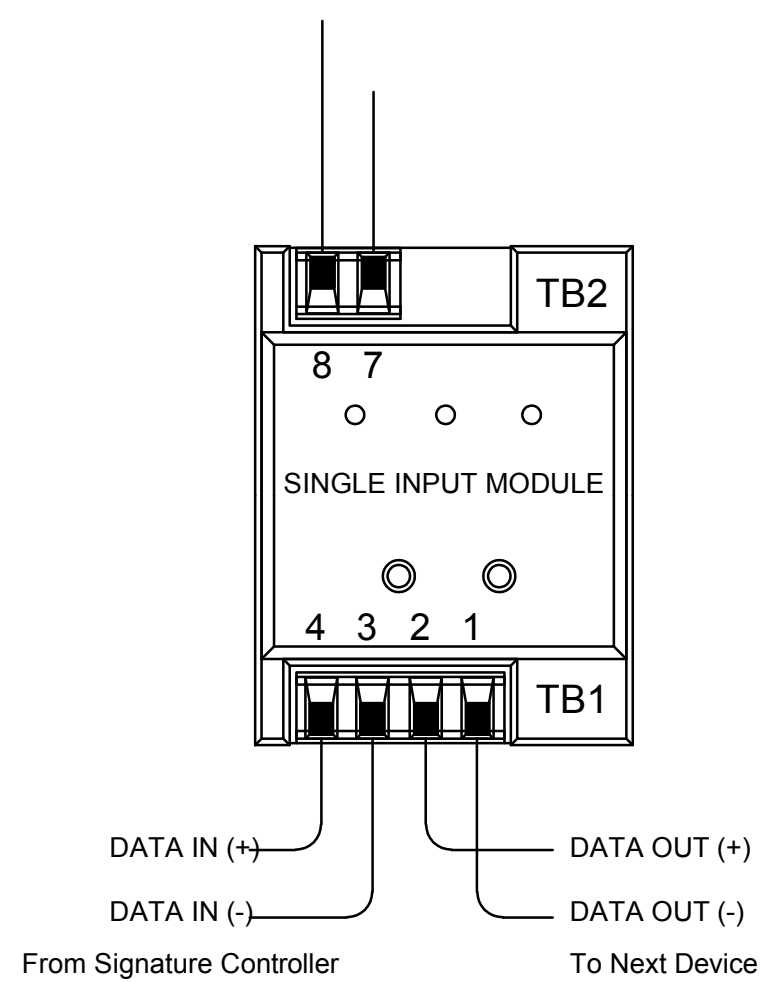
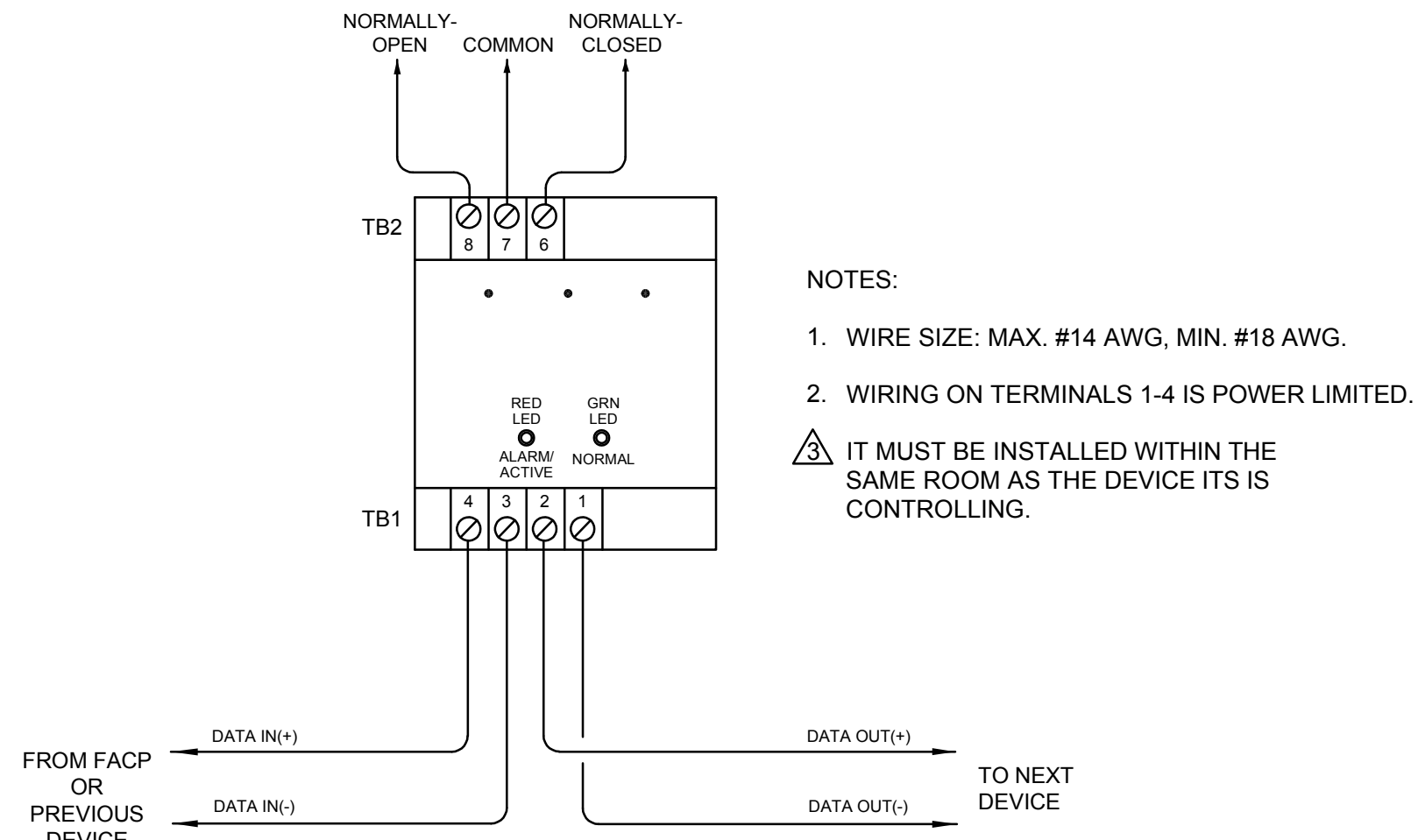
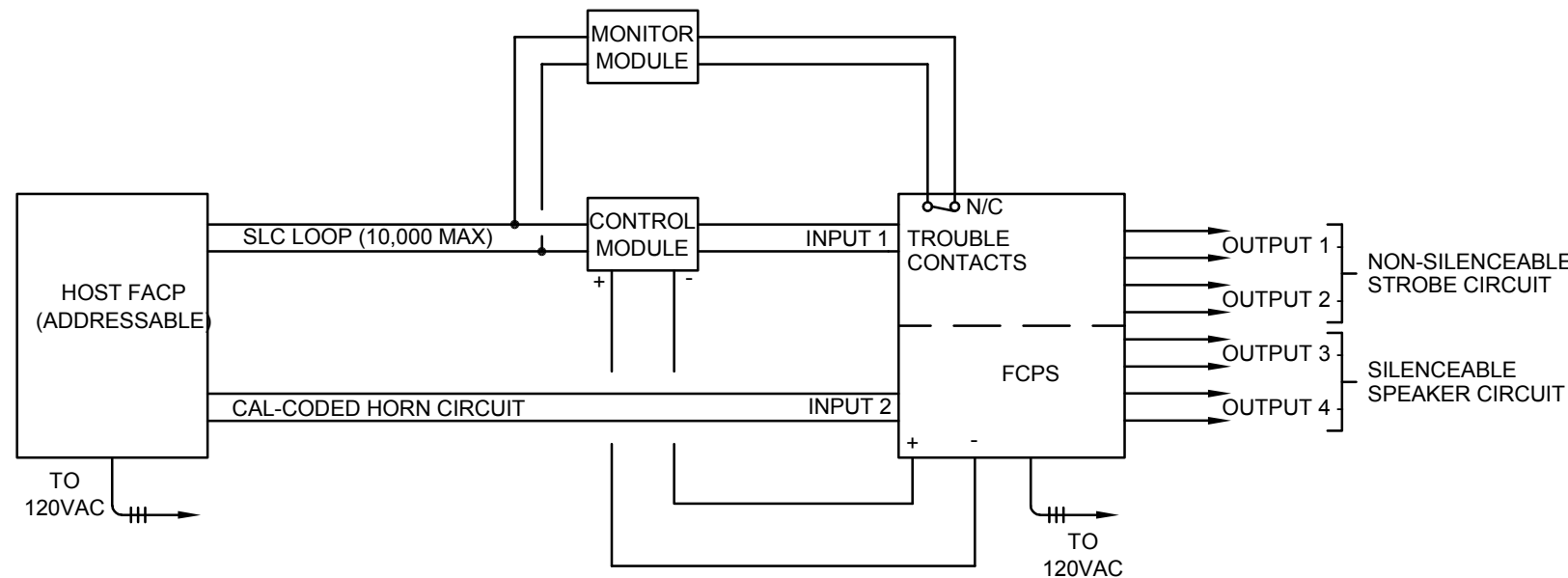


FIRE ALARM EQUIPMENT MOUNTING DETAIL

NOT TO SCALE 5

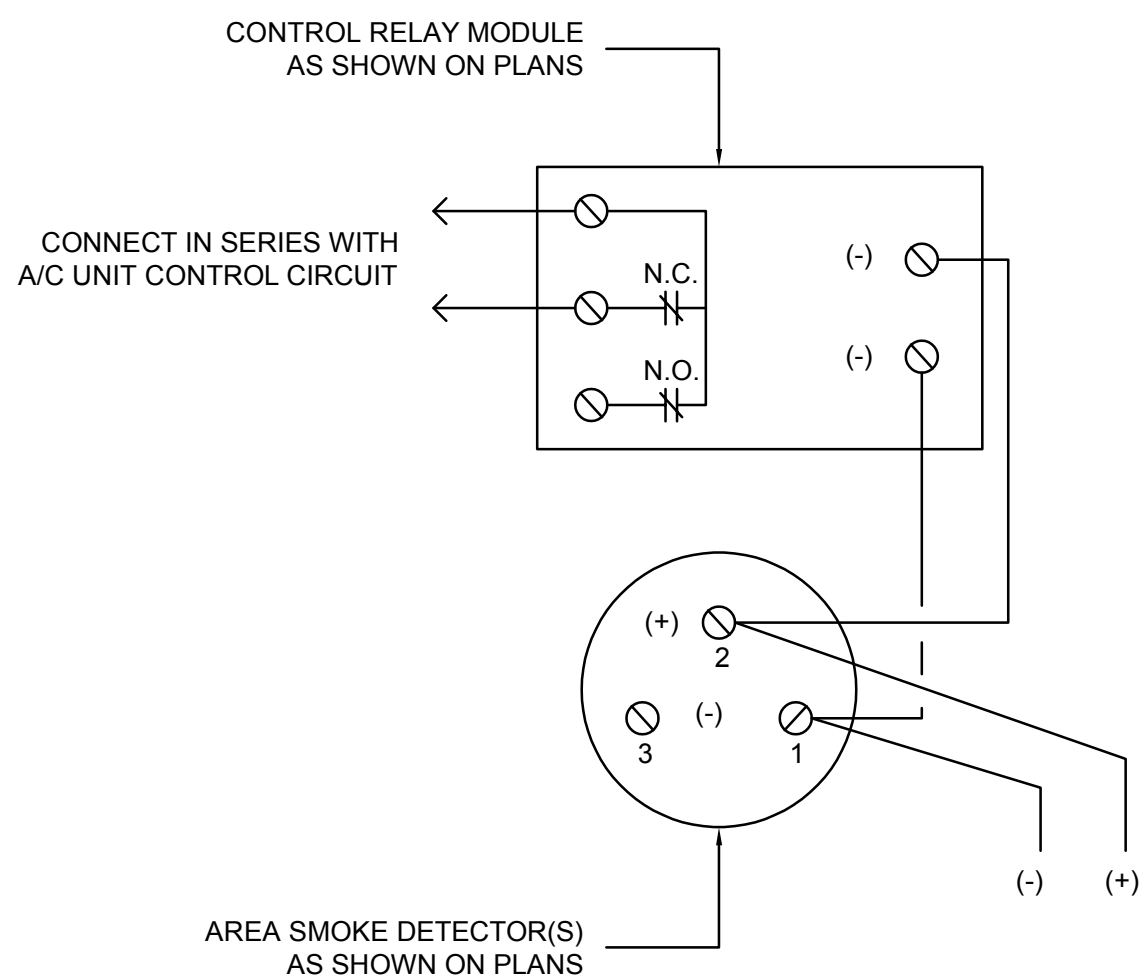
TYPICAL A/C SHUTDOWN CONTROLS

NOT TO SCALE 3



MONITOR MODULE WIRING DIAGRAM

NOT TO SCALE 2



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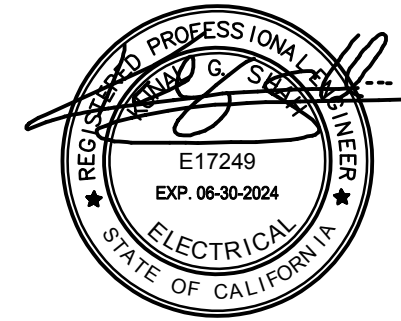


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CONSULTANTS STAMP:



SCHOOL DISTRICT:

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DISTRICT

PROJECT:

BONITA H.S.
GYMNASIUM

JOB NUMBER:

DATE: 2022-01-14

REVISION: DATE: _____

REVISION: DATE: _____

DRAWING TITLE:

FIRE ALARM
DETAILS

DRAWING NO.:

EF3.1

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS, 2019 CBC

Application Number: 03-122102	School Name: BONITA HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-20 16:02:03

2019 CBC

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A (2019 CBC).

****NOTE:** Undefined section and table references found in this document are from the CBC, or California Building Code.

KEY TO COLUMNS

1. TYPE	2. PERFORMED BY
Continuous – Indicates that a continuous special inspection is required	GE – Indicates that the special inspection shall be performed by a registered geotechnical engineer or his or her authorized representative.
Periodic – Indicates that a periodic special inspection is required	LOR – Indicates that the test or special inspection shall be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See CAC Section 4-335.
Test – Indicates that a test is required	PI – Indicates that the special inspection may be performed by a project inspector when specifically approved by DSA.
	SI – Indicates that the special inspection shall be performed by an appropriately qualified/approved special inspector.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2019 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

Application Number: 03-122102	School Name: BONITA HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-20 16:02:03

Geotechnical Reports: Project does NOT have and does NOT require a geotechnical report

S1. GENERAL:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify that: <ul style="list-style-type: none">• Site has been prepared properly prior to placement of controlled fill and/or excavations for foundations.• Foundation excavations are extended to proper depth and have reached proper material.• Materials below footings are adequate to achieve the design bearing capacity.	See Notes	PI	Refer to specific items identified in the Appendix listing exemptions for limitations. Placement of controlled fill exceeding 12" depth under foundations is not permitted without a geotechnical report.

S2. SOIL COMPACTION AND FILL:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify use of proper materials, densities and inspect lift thicknesses, placement and compaction during placement of fill.	Continuous	LOR*	* Under the supervision of a geotechnical engineer or LOR's engineering manager. Refer to specific items identified in the Appendix listing exemptions for limitations.
<input checked="" type="checkbox"/>	b. Compaction testing.	Test	LOR*	* Under the supervision of a geotechnical engineer or LOR's engineering manager. Refer to specific items identified in the Appendix listing exemptions for limitations.

S3. DRIVEN DEEP FOUNDATIONS (PILES):				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Verify pile materials, sizes and lengths comply with the requirements.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/>	b. Determine capacities of test piles and conduct additional load tests as required.	Test	LOR*	* Under the supervision of the geotechnical engineer.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2019 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

Application Number: 03-122102	School Name: BONITA HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-20 16:02:03

	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	c. Inspect driving operations and maintain complete and accurate records for each pile.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/>	d. Verify locations of piles and their plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and record any pile damage.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/>	e. Steel piles.	Provide tests and inspections per STEEL section below.		
<input type="checkbox"/>	f. Concrete piles and concrete filled piles.	Provide tests and inspections per CONCRETE section below.		
<input type="checkbox"/>	g. For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	*	*	* As defined on drawings or specifications.

	S4. CAST-IN-PLACE DEEP FOUNDATIONS (PIERS):			
	Test or Special Inspection	Type	Performed By	Code References and Note
<input type="checkbox"/>	a. Inspect drilling operations and maintain complete and accurate records for each pier.	Continuous	PI	Continuous inspection to be provided by project inspector. Refer to specific items identified in the Appendix listing exemptions for limitations.
<input type="checkbox"/>	b. Verify pier locations, diameters, plumbness and lengths. Record concrete or grout volumes.	Continuous	PI	Continuous inspection to be provided by project inspector. Refer to specific items identified in the Appendix listing exemptions for limitations.
<input type="checkbox"/>	c. Concrete piers.	Provide tests and inspections per CONCRETE section below.		

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2019 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

Application Number: 03-122102	School Name: BONITA HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-20 16:02:03

	Test or Special Inspection	Type	Performed By	Code References and Notes
	S5. RETAINING WALLS:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Placement, compaction and inspection of backfill.	Continuous	GE*	1705A.6.1. * By geotechnical engineer or his or her qualified representative. (See S2 above).
<input type="checkbox"/>	b. Placement of soil reinforcement and/or drainage devices.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/>	c. Segmental retaining walls; inspect placement of units, dowels, connectors, etc.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative. See DSA IR 16-3.
<input type="checkbox"/>	d. Concrete retaining walls.	Provide tests and inspections per CONCRETE section below.		
<input type="checkbox"/>	e. Masonry retaining walls.	Provide tests and inspections per MASONRY section below.		

	S6. OTHER SOILS:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Soil Improvements	Test	GE*	Submit a comprehensive report documenting final soil improvements constructed, construction observation and the results of the confirmation testing and analysis to CGS for final acceptance. * By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/>	b. Inspection of Soil Improvements	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/>	c.			

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2019 CBC

Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

Application Number: 03-122102	School Name: BONITA HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-20 16:02:03

C1. CAST-IN-PLACE CONCRETE				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify use of required design mix.	Periodic	SI	Table 1705A.3 Item 5, 1910A.1.
<input checked="" type="checkbox"/>	b. Identify, sample, and test reinforcing steel.	Test	LOR	1910A.2; ACI 318-14 Section 26.6.1.2; DSA IR 17-10. (See Appendix for exemptions.)
<input checked="" type="checkbox"/>	c. During concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	Test	LOR	Table 1705A.3 Item 6; ACI 318-14 Sections 26.5 & 26.12.
<input checked="" type="checkbox"/>	d. Test concrete (f'c).	Test	LOR	1905A.1.15; ACI 318-14 Section 26.12.
<input checked="" type="checkbox"/>	e. Batch plant inspection: Continuous	See Notes	SI	Default of ' Continuous ' per 1705A.3.3. If approved by DSA, batch plant inspection may be reduced to ' Periodic ' subject to requirements in Section 1705A.3.3.1, or eliminated per 1705A.3.3.2. See IR 17-13. (See Appendix for exemptions.)
<input type="checkbox"/>	f. Welding of reinforcing steel.	Provide special inspection per STEEL, Category S/A4(d) & (e) and/or S/A5(g) & (h) below.		

C2. PRESTRESSED / POST-TENSIONED CONCRETE (IN ADDITION TO SECTION C1):				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Sample and test prestressing tendons and anchorages.	Test	LOR	1705A.3.4, 1910A.3
<input type="checkbox"/>	b. Inspect placement of prestressing tendons.	Periodic	SI	1705A.3.4, Table 1705A.3 Items 1 & 9.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2019 CBC

Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

Application Number: 03-122102	School Name: BONITA HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-20 16:02:03

	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	c. Verify in-situ concrete strength prior to stressing of post-tensioning tendons.	Periodic	SI	Table 1705A.3 Item 11. Special inspector to verify specified concrete strength test prior to stressing.
<input type="checkbox"/>	d. Inspect application of post-tensioning or prestressing forces and grouting of bonded prestressing tendons.	Continuous	SI	1705A.3.4, Table 1705A.3 Item 9; ACI 318-14 Section 26.13

	C3. PRECAST CONCRETE (IN ADDITION TO SECTION C1):			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect fabrication of precast concrete members.	Continuous	SI	ACI 318-14 Section 26.13.
<input type="checkbox"/>	b. Inspect erection of precast concrete members.	Periodic	SI*	Table 1705A.3 Item 10. * May be performed by PI when specifically approved by DSA.

	C4. SHOTCRETE (IN ADDITION TO SECTION C1):			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect shotcrete placement for proper application techniques.	Continuous	SI	1705A.19, Table 1705A.3 Item 7, 1908A.6, 1908A.7, 1908A.8, 1908A.9, 1908A.11, 1908A.12. See ACI 506.2-13 Section 3.4, ACI 506R-16.
<input type="checkbox"/>	b. Sample and test shotcrete (f'_c).	Test	LOR	1908A.5, 1908A.10.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2019 CBC

Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

Application Number: 03-122102	School Name: BONITA HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
DSA File Number: 19-H3	Increment Number:	Date Created: 2022-10-20 16:02:03

C5. POST-INSTALLED ANCHORS:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Inspect installation of post-installed anchors	See Notes	SI*	1617A.1.19, Table 1705A.3 Item 4a (Continuous) & 4b (Periodic), 1705A.3.8 (See Appendix for exemptions). ACI 318-14 Sections 17.8 & 26.13. * May be performed by the project inspector when specifically approved by DSA.
<input checked="" type="checkbox"/>	b. Test post-installed anchors.	Test	LOR	1910A.5. (See Appendix for exemptions.)

C6. OTHER CONCRETE:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a.			

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (STEEL AND ALUMINUM), 2019 CBC

1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

Application Number:

03-122102

DSA File Number:

19-H3

School Name:

BONITA HIGH SCHOOL

Increment Number:

School District:

BONITA UNIFIED SCHOOL DISTRICT

Date Created:

2022-10-20 16:02:03

S/A1. STRUCTURAL STEEL, COLD-FORMED STEEL AND ALUMINUM USED FOR STRUCTURAL PURPOSES				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify identification of all materials and: • Mill certificates indicate material properties that comply with requirements. • Material sizes, types and grades comply with requirements.	Periodic	*	Table 1705A.2.1 Item 3a 3c. 2202A.1; AISI S100-16 Section A3.1 & A3.2, AISI S240-15 Section A3 & A5, AISI S220-15 Sections A4 & A6. * By special inspector or qualified technician when performed off-site.
<input checked="" type="checkbox"/>	b. Test unidentified materials	Test	LOR	2202A.1.
<input checked="" type="checkbox"/>	c. Examine seam welds of HSS shapes	Periodic	SI	DSA IR 17-3.
<input checked="" type="checkbox"/>	d. Verify and document steel fabrication per DSA-approved construction documents.	Periodic	SI	Not applicable to cold-formed steel light-frame construction, except for trusses (1705A.2.4).
<input type="checkbox"/>	e. Buckling restrained braces.	Test	LOR	Testing and special inspections in accordance with IR 22-4.

S/A2. HIGH-STRENGTH BOLTS:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the DSA-approved documents.	Periodic	SI	Table 1705A.2.1 Items 1a & 1b, 2202A.1; AISC 360-16 Section A3.3, J3.1, and N3.2; RCSC 2014 Section 1.5 & 2.1; DSA IR 17-8 & DSA IR 17-9.
<input checked="" type="checkbox"/>	b. Test high-strength bolts, nuts and washers.	Test	LOR	Table 1705A.2.1 Item 1c, 2213A.1; RCSC 2014 Section 7.2; DSA IR 17-8.
<input type="checkbox"/>	c. Bearing-type ("snug tight") connections.	Periodic	SI	Table 1705A.2.1 Item 2a, 1705A.2.6, 2204A.2; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Section 9.1; DSA IR 17-9.
<input checked="" type="checkbox"/>	d. Pretensioned and slip-critical connections.	*	SI	Table 1705A.2.1 Items 2b & 2c, 1705A.2.6, 2204A.2; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Sections 9.2 & 9.3; DSA IR 17-9. * "Continuous" or "Periodic" depends on the tightening method used.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (STEEL AND ALUMINUM), 2019 CBC

1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

Application Number:

03-122102

School Name:

BONITA HIGH SCHOOL

School District:

BONITA UNIFIED SCHOOL DISTRICT

DSA File Number:

19-H3

Increment Number:

Date Created:

2022-10-20 16:02:03

S/A3. WELDING:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify weld filler material identification markings per AWS designation listed on the DSA-approved documents and the WPS.	Periodic	SI	1705A.2.5, Table 1705A.2.1 Items 4 & 5; AWS D1.1 and AWS D1.8 for structural steel; AWS D1.2 for Aluminum; AWS D1.3 for cold-formed steel; AWS D1.4 for reinforcing steel; DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Verify weld filler material manufacturer's certificate of compliance.	Periodic	SI	DSA IR 17-3.
<input checked="" type="checkbox"/>	c. Verify WPS, welder qualifications and equipment.	Periodic	SI	DSA IR 17-3.

S/A4. SHOP WELDING (IN ADDITION TO SECTION S/A3):				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	Continuous	SI	Table 1705A.2.1 Items 5a.1 4; AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds.	Periodic	SI	1705A.2.2, Table 1705A.2.1 Items 5a.5 & 5a.6; AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	c. Inspect welding of stairs and railing systems.	Periodic	SI	1705A.2.1; AISC 360-16 (and AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3.
<input type="checkbox"/>	d. Verification of reinforcing steel weldability other than ASTM A706.	Periodic	SI	1705A.3.1; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
<input type="checkbox"/>	e. Inspect welding of reinforcing steel.	Continuous	SI	Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8; AWS D1.4; DSA IR 17-3.

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A5. FIELD WELDING (IN ADDITION TO SECTION S/A3):			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	Continuous	SI	Table 1705A.2.1 Items 5a.1 4; AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Inspect single-pass fillet welds ≤ 5/16".	Periodic	SI	Table 1705A.2.1 Item 5a.5; AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	c. Inspect end-welded studs (ASTM A-108) installation (including bend test).	Periodic	SI	2213A.2; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1; DSA IR 17-3.
<input type="checkbox"/>	d. Inspect floor and roof deck welds.	Periodic	SI	1705A.2.2, Table 1705A.2.1 Item 5a.6; AISC 360-16 (AISC 341-16 as applicable); AWS D1.3; DSA IR 17-3.
<input type="checkbox"/>	e. Inspect welding of structural cold-formed steel.	Periodic	SI*	1705A.2.5; AWS D1.3; DSA IR 17-3. The quality control provisions of AISI S240-15 Chapter D shall also apply. * May be performed by the project inspector when specifically approved by DSA.
<input type="checkbox"/>	f. Inspect welding of stairs and railing systems.	Periodic	SI*	1705A.2.1; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3. * May be performed by the project inspector when specifically approved by DSA.
<input type="checkbox"/>	g. Verification of reinforcing steel weldability.	Periodic	SI	1705A.3.1; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
<input type="checkbox"/>	h. Inspect welding of reinforcing steel.	Continuous	SI	Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8; AWS D1.4; DSA IR 17-3.

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A6. NONDESTRUCTIVE TESTING:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Ultrasonic	Test	LOR	1705A.2.1, 1705A.2.5; AISC 341-16 J6.2, AISC 360-16 N5.5; ANSI/ASNT CP-189, SNT-TC-1A; AWS D1.1, AWS D1.8; DSA IR 17-2.
<input type="checkbox"/>	b. Magnetic Particle	Test	LOR	1705A.2.1, 1705A.2.5; AISC 341-16 J6.2, AISC 360-16 N5.5; ANSI/ASNT CP-189, SNT-TC-1A; AWS D1.1, AWS D1.8; DSA IR 17-2.
<input type="checkbox"/>	c.	Test	LOR	

	S/A7. STEEL JOISTS AND TRUSSES:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Verify size, type and grade for all chord and web members as well as connectors and weld filler material; verify joist profile, dimensions and camber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist.	Continuous	SI	1705A.2.3, Table 1705A.2.3; AWS D1.1; DSA IR 22-3 for steel joists only. 1705A.2.4; AWS D1.3 for cold-formed steel trusses.

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A8. SPRAY APPLIED FIRE-PROOFING:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Examine structural steel surface conditions, inspect application, take samples, measure thickness and verify compliance of all aspects of application with DSA-approved documents.	Periodic	SI	1705A.14.
<input type="checkbox"/>	b. Test bond strength.	Test	LOR	1705A.14.6.
<input type="checkbox"/>	c. Test density.	Test	LOR	1705A.14.5.

	S/A9. ANCHOR BOLTS AND ANCHOR RODS:			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Anchor Bolts and Anchor Rods	Test	LOR	Sample and test anchor bolts and anchor rods not readily identifiable per procedures noted in DSA IR 17-11.
<input type="checkbox"/>	b. Threaded rod not used for foundation anchorage.	Test	LOR	Sample and test threaded rods not readily identifiable per procedures noted in DSA IR 17-11.

	S/A10. Other Steel			
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a.			

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

Application Number: 03-122102	School Name: BONITA HIGH SCHOOL	School District: BONITA UNIFIED SCHOOL DISTRICT
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Exempt items given in DSA IR A-22 or the 2019 CBC (including DSA amendments) and those items identified below with a check mark by the design professional are NOT subject to DSA requirements for the structural tests / special inspections noted. **Items marked as exempt shall be identified on the approved construction documents.** The project inspector shall verify all construction complies with the approved construction documents.

	SOILS:
<input type="checkbox"/>	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per CBC Table 1806A.2 and having no geotechnical report for the following cases: A) free standing sign or scoreboard, B) cell or antenna towers and poles less than 35'-0" tall (e.g., lighting poles, flag poles, poles supporting open mesh fences, etc.), C) single-story structure with dead load less than 5 psf (e.g., open fabric shade structure), or D) covered walkway structure with an apex height less than 10'-0" above adjacent grade.
<input type="checkbox"/>	2. Shallow foundations, etc. are exempt from special inspections and testing by a Geotechnical Engineer for the following cases: A) buildings without a geotechnical report and meeting the exception item #1 criteria in CBC Section 1803A.2 supported by native soil (any excavation depth) or fill soil (not exceeding 12" depth per CBC Section 1804A.6), B) soil scarification/recompaction not exceeding 12" depth, C) native or fill soil supporting exterior non-structural flatwork (e.g., sidewalks, site concrete ramps, site stairs, parking lots, driveways, etc.), D) unpaved landscaping and playground areas, or E) utility trench backfill.

	CONCRETE/MASONRY:
<input type="checkbox"/>	1. Post-installed anchors for the following: A) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding" in the Appendix below) given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) or B) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
<input type="checkbox"/>	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
<input type="checkbox"/>	3. Non-bearing non-shear masonry walls may be exempt from certain DSA masonry testing and special inspection items as allowed per DSA IR 21-1.16. Refer to construction documents for specific exemptions accordingly for each applicable wall condition.
<input type="checkbox"/>	4. Epoxy shear dowels in site flatwork and/or other non-structural concrete.

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

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	CONCRETE/MASONRY:
<input type="checkbox"/>	5. Testing of reinforcing bars is not required for items given in CBC Section 1910A.2 subject to the requirements and limitations in that section.

	WELDING:
<input type="checkbox"/>	1. Solid-clad and open-mesh fences, gates with maximum leaf span of 10', and gates with a maximum rolling section of 10' all having an apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates/fences are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
<input type="checkbox"/>	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds shall not be ground flush.
<input type="checkbox"/>	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
<input type="checkbox"/>	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
<input type="checkbox"/>	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
<input type="checkbox"/>	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for sections S/A3, S/A4 and/or S/A5 located in the Steel/Aluminum category).
<input type="checkbox"/>	7. Any support for exempt non-structural components given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) meeting the following: A) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤4' above supporting floor/roof, B) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS(SIGNATURE), 2019 CBC

Application Number:

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School Name:

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Name of Architect or Engineer in general responsible charge:

S. MARK GELSINGER

Name of Structural Engineer (When structural design has been delegated):

PETER RAVENKAMP, S.E.

Signature of Architect or Structural Engineer:

Date:

10/20/2022

Note: To facilitate DSA electronic mark-ups and identification stamp application, DSA recommends against using secured electronic or digital signatures.



DSA STAMP

DSA 103-19: LIST OF REQUIRED VERIFIED REPORTS, CBC 2019

Application Number:
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School Name:
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Increment Number:

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1. Structural Testing and Inspection: Laboratory Verified Report Form DSA 291

2. Concrete Batch Plant Inspection: Laboratory Verified Report Form DSA 291

3. Post-installed Anchors: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

4. Shop Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

5. Field Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

6. High-Strength Bolt Installation Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
