

# project manual

bidding and contracting requirements



## TOM HAWKINS ELEMENTARY SCHOOL ADMINISTRATION MODERNIZATION JEFFERSON SCHOOL DISTRICT

pjhm•architects

OC /// 24461 Ridge Route Drive #100 • Laguna Hills, CA 92653 P /// 949-496-6191  
SD /// 804 Pier View Way #103 • Oceanside, CA 92054 P /// 760-730-5527



# TOM HAWKINS ELEMENTARY SCHOOL ADMINISTRATION MODERNIZATION

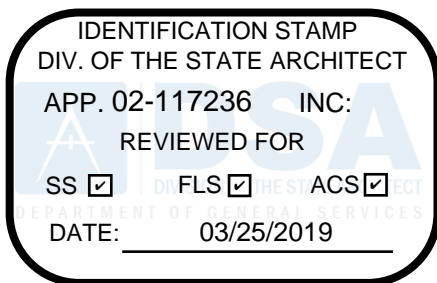
JEFFERSON SCHOOL DISTRICT



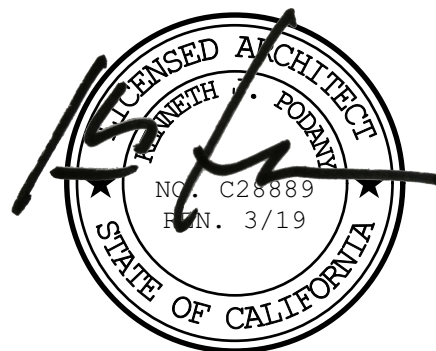
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**BID DOCUMENTS AND GENERAL CONDITIONS  
FOR THE  
JEFFERSON ELEMENTARY SCHOOL DISTRICT  
FOR**

**Tom Hawkins Elementary School  
Administration Modernization  
DSA Application #02-117236**

**475 Darlene Lane  
Tracy, CA. 95377**

**Project No. JESD\_Const\_18\_19\_002**

**March 25, 2019**

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## **NOTICE INVITING BIDS**

### **JEFFERSON ELEMENTARY SCHOOL DISTRICT**

NOTICE IS HEREBY GIVEN that the Jefferson Elementary School District, acting by and through its Governing Board, hereinafter referred to as “District”, will receive prior to **2:00 pm on the 30<sup>th</sup> day of April 2019** sealed bids for the award of a Contract for the following:

BID NO. JESD\_Const\_18\_19\_002

Tom Hawkins Elementary School Administration Modernization

All bids shall be made and presented only on the forms presented by the District. Bids shall be received in the Office of the **Jefferson Elementary School District located at 1219 Whispering Wind Dr., Tracy, CA.95377**, and shall be opened and publicly read aloud at the above-stated time and place. Any bids received after the time specified above or after any extensions due to material changes shall be returned unopened.

#### **Miscellaneous Information**

Bids shall be received in the place identified above, and shall be opened and publicly read aloud at the above-stated time and place.

The bid documents are available for contractors to download from the District’s website: <https://www.jeffersonschooldistrict.com>

Interested bidders must notify Sam Hagler, Director of Maintenance, Operations & Transportation and Roberto Silver, PJHM Architects of their intent to bid the project via email: [shagler@sjcoe.net](mailto:shagler@sjcoe.net) [Roberto@pjhm.com](mailto:Roberto@pjhm.com)

There will be a Pre-Bid Conference on April 15<sup>th</sup> at 11:00 am. Meet at Tom Hawkins Elementary School – 475 Darlene Lane, Tracy, CA 95377.

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 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.

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

Project Schedule: It is the District’s intent to award a contract at a Board meeting to held in May, with an anticipated construction start date of June 3, 2019. Time for completion is 120 calendar days. The schedule extends into the school year (school is out of session from May 29 – August 8, 2019).

Fingerprinting and background checks will be required per Article 35 of the General Conditions.

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) cash; (2) a cashier's check made payable to the District; (3) a certified check made payable to the District; or (4) 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.

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JEFFERSON ELEMENTARY 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) cash; (2) a cashier's check made payable to the District; (3) a certified check made payable to the District; or (4) 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 others 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 three (3). 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: PJHM Architects, Inc.  
Kenneth Podany, Architect.  
ken@pjhm.com

CC: Roberto Silver, Project Manager  
roberto@pjhm.com

CC: Jefferson School District  
Sam Hagler, Director of Maintenance, Operations & Transportation  
shagler@sjcoe.net

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 Facilities 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 Chief Business Official or their 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:

Jefferson Elementary School District  
Facilities Department  
1219 Whispering Wind  
Tracy, CA 95377

c. Appeal Review: The Chief Business Official or their designee shall review the decision on the bid protest from the Director of Facilities 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 Chief Business Official 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](http://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 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, may be downloaded from the District's website:

**Jefferson Elementary School District**  
**<https://www.jeffersonschooldistrict.com>**

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.

28. Addenda. Clarification or any other notice of a change in the Bidding Documents will be issued only by the Architect on behalf of the District and only in the form of a written Addendum, transmitted by fax, e-mail, or available for download from the District's website 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.

29. 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 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)

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

|                 |   |        |  |
|-----------------|---|--------|--|
| PROJECT NAME:   | Tom Hawkins Elementary School Administration Modernization                                    |        |  |
| PROJECT NUMBER: | JESD_Const_18_19_002  |        |  |
| TO:             | Ken Podany, Architect<br>Roberto Silver, Project Mgr<br>Sam Hagler, Director of<br>Facilities | EMAIL: | ken@pjhm.com<br>roberto@pjhm.com,<br>shagler@sjcoe.net |

|                              |  |                    |        |  |
|------------------------------|--|--------------------|--------|--|
| DATE:                        |  |                    |        |  |
| FROM:                        |  |                    | EMAIL: |  |
| DOCUMENT/DIVISION<br>NUMBER: |  | DRAWING<br>NUMBER: |        |  |

|                            |  |
|----------------------------|--|
| REQUESTED CLARIFICATION:   |  |
| RESPONSE TO CLARIFICATION: |  |

Attach additional numbered sheets as necessary; however, only one (1) request shall be contained on each submitted form.

**BID FORM**

FOR

**Tom Hawkins Elementary School Administration Modernization**

DSA A#02-117236

Project/Bid No. JESD\_Const\_18\_19\_002

FOR

JEFFERSON ELEMENTARY SCHOOL DISTRICT

CONTRACTOR  
NAME:

\_\_\_\_\_

ADDRESS:

\_\_\_\_\_

\_\_\_\_\_

TELEPHONE:

(       ) \_\_\_\_\_

FAX:

(       ) \_\_\_\_\_

EMAIL

\_\_\_\_\_

TO: Jefferson Elementary 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. JESD\_Const\_18\_19\_002

Tom Hawkins Elementary School Administration Modernization

in the District described above, all in strict conformance with the drawings and other Contract Documents on file at the 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. TOTAL CASH PURCHASE PRICE IN WORDS & NUMBERS:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_ DOLLARS

(\$ \_\_\_\_\_ )

4. 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, and the requisite time to complete the 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.

5. 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.

6. 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)

7. The required List of Designated Subcontractors is attached hereto.

8. The required Non-Collusion Declaration is attached hereto.

9. The Substitution Request Form, if applicable, is attached hereto.

10. 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.

11. The names of all persons interested in the foregoing proposal as principals are as follows:

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(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.)

12. PROTEST PROCEDURES. If there is a bid protest, the grounds shall be submitted as set forth in the Instructions to Bidders.

13. 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.

14. 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.

15. 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 (if any), 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.

16. 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 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)

17. 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

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.

## **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.

Subletting or subcontracting of any portion of the work in excess of one-half of one percent of the Contractor's total bid where no subcontractor was designated in the original bid shall only be permitted in cases of public emergency or necessity, and then only after a finding, reduced to writing as a public record, of the authority awarding this Contract setting forth the facts constituting the emergency or necessity.

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.

**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**

| <b>Description &amp;<br/>Portion of Work</b> | <b>Name of Subcontractor</b> | <b>Location &amp; Place of Business</b> | <b>License Type<br/>and Number</b> | <b>DIR Registration<br/>Number</b> | <b><i>Email &amp;<br/>Telephone*</i></b> |
|--|------------------------------|---|------------------------------------|------------------------------------|--|
|  |                              |   |                                    |                                    |  |
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|  |                              |   |                                    |                                    |  |

| <b>Description &amp; Portion of Work</b> | <b>Name of Subcontractor</b> | <b>Location &amp; Place of Business</b> | <b>License Type and Number</b> | <b>DIR Registration Number</b> | <b><i>Email &amp; Telephone*</i></b> |
|--|------------------------------|---|--------------------------------|--------------------------------|--------------------------------------|
|  |                              |   |                                |                                |                                      |
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|  |                              |   |                                |                                |                                      |

\* This information must be provided at the time of submission of bid or must be provided within 24 hours after the time set for the opening of bids. Bidders who choose to provide this information within 24 hours after the time set for the opening of bids are solely responsible to ensure the District receives this information in a timely manner. The District is not responsible for any problems or delays associated with emails, faxes, delivery, etc. Absent a verified fax or email receipt date and time by the District, the District's determination of whether the information was received timely shall govern and be determinative. Bidder shall not revise or amend any other information in this form submitted at the time of bid. The information submitted at the time of bid shall govern over any conflicts, discrepancies, ambiguities or other differences in any subsequent Subcontractor Designation Forms submitted by the bidder.

Proper Name of Bidder:

Date:

Name:

Signature of Bidder

Representative:

Address:

Phone:

**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.

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(Signature)

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(Print)

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(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 Jefferson Elementary School District or a certified check payable to the order of the Jefferson Elementary 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.

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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 Jefferson Elementary 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)

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

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

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## **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 <sup>1</sup> (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

<sup>1</sup> 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.

maintenance, including adequacy and 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.

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 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 and shall provide required Schedule information (including schedule fragnets, if applicable) for the substituted item. 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 if the Contractor is awarded the Project.

Name of Bidder: \_\_\_\_\_

By: \_\_\_\_\_

District: \_\_\_\_\_

By: \_\_\_\_\_

**ACKNOWLEDGMENT OF BIDDING PRACTICES REGARDING INDEMNITY FORM**

TO: Jefferson Elementary School District

RE: Project Number JESD\_Const\_18\_19\_002

Construction Contract for Tom Hawkins Elementary School Administration Modernization

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.

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Contracting Party

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Name of Agent/Title

**DISABLED VETERAN BUSINESS ENTERPRISE (DVBE) PARTICIPATION**  
**STATEMENT**

Each bidder must complete this form in order to comply with the Jefferson Elementary 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: Tom Hawkins Elementary School Administration Modernization

Bid No.: JESD\_Const\_18\_19\_002

DSA No.: 02-117236

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 Jefferson Elementary 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

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Tom Hawkins Elementary School  
Administration Modernization  
Jefferson Elementary School District

Contractor's Certificate Regarding Drug-Free Workplace

Page 33

**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 \_\_\_\_\_, 20\_\_ in the County of San Joaquin of the State of California, by and between the Jefferson Elementary 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 \_\_\_\_\_ ("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 Complete the Project (See Article 47) within **120 calendar days** from receipt of the Notice to Proceed. This shall be called Contract Time. 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.

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 **One Thousand Dollars (\$ 1,000.00 )** 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.

**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/supplies/ 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  
Bid Form  
Designation of Subcontractors  
Contractor's Certificate Regarding Worker's Compensation  
Non-Collusion Declaration  
Bid Guarantee Form  
Bid Bond  
Substitution Request Form  
Acknowledgment of Bidding Practices Regarding Indemnity  
DVBE Participation Statement and Close-Out Forms  
Contractor's Certificate Regarding Drug-Free Workplace  
Contractor's Certificate Regarding Alcohol and Tobacco

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 Background Checks  
General Conditions  
Supplementary and Special Conditions (if any)  
Specifications  
All Addenda as Issued  
Drawings/Plans  
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 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** 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.

Jefferson Elementary School District

CONTRACTOR:

By: \_\_\_\_\_

\_\_\_\_\_  
Typed or Printed Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
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 JEFFERSON ELEMENTARY 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, 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 JEFFERSON ELEMENTARY 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).

Any claims under this bond may be addressed to:

Any claims under this bond may be addressed to:  
(Name and Address of Surety)

(Name and Address of Surety)

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

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---

---

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.

**PERFORMANCE BOND**  
**(CALIFORNIA PUBLIC WORK)**

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the JEFFERSON ELEMENTARY 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 JEFFERSON ELEMENTARY 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 Oblige 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 Oblige 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 Oblige'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 Oblige of the lowest responsible bidder, arrange for a contract between such bidder and the Oblige 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 Oblige under the Contract and any modifications thereto, less the amount previously paid by the Oblige to the Principal, less any withholdings by the Oblige allowed under the Contract. Oblige shall not be required or obligated to accept a tender of a completion contractor from the Surety.

Surety expressly agrees that the Oblige 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 Oblige, 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 Oblige 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 Oblige is required to engage the services of an attorney in connection with enforcement of the bond, Contractor and Surety shall pay Oblige'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 Oblige and judgment is recovered, the Surety shall pay all costs incurred by the Oblige 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 Jefferson Elementary 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 Jefferson Elementary School District, 143 East First Street, Perris, CA 92570, 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, 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 Jefferson Elementary 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 18 of the General Conditions.

1. **General Liability Insurance:** Certificate of Insurance with all specific insurance coverages set forth in Article 18 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 18 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 18 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 18 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)*



## ARTICLE 1 DEFINITIONS

1. Action of the Governing Board is a vote of a majority of the District's governing board.
2. Approval means written authorization through action of the governing board unless specific delegation of approval authority is delegated to a District representative.

(ALTERNATE CLAUSE – This clause may only be used if the District has already delegated the authority to the Superintendent prior to the commencement of the Project.)

Approval means written authorization through action of the governing board. The governing board has delegated to the Superintendent the authority to approve certain modifications and Construction Change Documents where the aggregate sum of the Construction Change Documents do not exceed \$15,000 and each individual item of the Construction Change Documents or modification does not exceed \$10,000. In no case shall the Assistant Superintendent have authority to approve total Construction Change Documents or modifications to the Project exceeding 10% of the contract sum.)

3. As shown, as indicated, as detailed refers to drawings accompanying this specification.
4. Contract, Contract Documents includes all contract documents to wit: Notice inviting Bids, Instructions to Bidders, Bid Form, Designation of Subcontractors, Performance Bond, Payment Bond, Certificates of Insurance, Insurance Policies, General Conditions, Supplementary or Special Conditions (if any), Drawings, Plans, Specifications, the Agreement and all modifications, addenda, and amendments thereto.
5. Contractor, District and Architect are those mentioned as such in the Agreement. They are treated throughout the contract as if they are of singular number and neuter gender.
6. Locality in which the work is performed means the county in which the public work is done.
7. Project is the planned undertaking as provided for in the contract documents by District and Contractor.
8. Provide shall include "provide complete in place", that is, "furnish & install".
9. Safety Orders are those issued by the Division of Industrial Safety an OSHA Safety and Health Standards for construction.
10. 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.
11. Subcontractor, as used herein, includes those having direct contract with Contractor and one who furnishes material worked to a special design according to plans, drawings, and specifications for this work, but does not include one who merely furnishes material not so worked.
12. Surety is the person, firm, or corporation that executes as surety the Contractor's Performance Bond and Payment Bond.
13. Work of the Contractor or subcontractor includes labor or materials (including, without installation, equipment and appliances) or both, incorporated in, or to be incorporated in the construction covered by the complete Contract.
14. Workers include laborer, worker or mechanic.

## ARTICLE 2 LAWS CONCERNING THE DISTRICT A PART HEREOF

Contract is subject to all provision of the Constitution of Laws of California governing, controlling or effecting District, or the property, funds operations, or powers of District, and such provisions are by his reference made a part hereof and of Contract.

### **ARTICLE 3 SITE INVESTIGATION**

Before bidding on this work, Contractor shall make a careful investigation of the site and thoroughly familiarize himself with the requirement of the Contract. By the act of submitting a bid for the work included in this Contract, Contractor shall be deemed to have made such study and investigation and that Contractor is familiar with and accepts the conditions of the site.

### **ARTICLE 4 STATUS OF CONTRACTOR**

A. Contractor is and shall at all times be deemed to be an independent Contractor and shall be wholly responsible for the manner in which it performs the services required of it by the terms of this contract. Nothing herein contained shall be construed as creating the relationship of employer and employee, or principal and agent, between the District, or any of the District's employees or agents, and Contractor or any of Contractor's agents or employees. Contractor assumes exclusively the responsibility for the acts of its employees as they relate to the services to be provided during the course and scope of their employment. Contractor, its agents and employees shall not be entitled to any rights or privileges of District employees. District shall be permitted to monitor the activities to determine compliance with the terms of this Contract. Contractor and subcontractors are required by law to be licensed and regulated by the Contractors State License Board.

B. 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.

C. 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.

### **ARTICLE 5 CONTRACTOR'S SUPERVISION**

A. During progress of the work, Contractor shall keep on the premises (including both the site and the plant) a superintendent satisfactory to District and, if applicable, Architect. Before commencing the work herein, Contractor shall give written notice to District 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 in writing. Superintendent shall represent Contractor and all directions given to Superintendent shall be as binding as if given to Contractor.

B. The Contractor shall verify all indicated dimensions before ordering materials or equipment, or before performing work. The Contractor shall take field measurements, verify field conditions, and shall carefully compare such field measurements and conditions and other information

known to the Contractor with the contract documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the Architect at once. Upon commencement of any item of work, the Contractor shall be responsible for dimensions related to such item of work and shall make any corrections necessary to make work properly fit at no additional cost to District. This responsibility for verification of dimensions is a non-delegable duty and may not be delegated to subcontractors or agents.

C. Omissions from the drawings or specifications, or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed work, but they shall be performed as if fully and correctly set forth and described in the drawings and specifications.

D. 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 give the Special Inspector fourteen (14) days to post to the DSA website. Contractor is responsible for delays and for failure to plan.

E. 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-13-01 for further discussion.

## **ARTICLE 6 SUBCONTRACTORS**

A. Contractor agrees to bind every subcontractor by terms of Contract as far as such terms are applicable to subcontractor's work. If Contractor shall subcontract any part of this Contract, Contractor shall be as fully responsible to District for acts and omissions of any subcontractor and of persons either directly or indirectly employed by any subcontractor, as it is for acts and omissions of persons directly employed by Contractor. Nothing contained in the contract documents shall create any contractual relation between any subcontractor and District, nor shall this Contract be construed to be for the benefit of any subcontractor. The Contractor shall be responsible for the coordination of the trades, subcontractors and materialmen engaged upon his work.

B. 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.

## **ARTICLE 7 DISTRICT'S INSPECTOR**

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. No work shall be carried on except with the knowledge and under the inspection of said Inspector(s). He shall have free access to any or all parts of work at any time. 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 day. Contractor shall reimburse District for inspection and testing outside the normal eight-hour day or for any retests caused by the Contractor.

## **ARTICLE 8 ARCHITECT'S STATUS**

A. The Architect shall be the District's representative during construction period and shall observe the progress and quality of the work on behalf of the District. Architect shall have the authority to act on behalf of District only to the extent expressly provided in the contract documents. Architect shall have authority to stop work whenever such stoppage may be necessary in Architect's reasonable opinion to insure the proper execution of Contract.

B. The Architect shall be, in the first instance, the judge of the performance of this Contract. Architect shall side neither with District nor with Contractor, but shall exercise authority under Contract to enforce its faithful performance by both. Nothing herein authorizes Architect to act as arbitrator for the parties.

C. The Architect shall have all authority and responsibility established by law, including Title 24 of the California Code of Regulations.

D. The Architect shall be the final authority in determining the amount of work satisfactorily completed and the amount of money due during the progress of construction.

## **ARTICLE 9 ASSIGNMENT OF ANTITRUST ACTIONS**

A. Pursuant to Government Code section 4551, in entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the 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. Section 15) or under the Cartwright Act (Chapter 2 [commencing with Section 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 final 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 Section 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.

B. 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.

## **ARTICLE 10 OTHER CONTRACTS**

A. District reserves the right to let other contracts in connection with this work. Contractor shall afford other contractors reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly connect and coordinate its work with theirs.

B. Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy at the Project site. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on Project. If simultaneous execution of any Contract for Project is likely to cause interference with performance of some other contract or contracts, 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.

## **ARTICLE 11 OCCUPANCY**

District reserves the right to occupy portions of the Project at any time before completion, and such occupancy shall constitute final acceptance of that portion only to the extent that the Contractor will not be subject to performing work or repairs caused by the District's use of the occupied areas. Such occupancy shall not extend the date specified for completion of the work. The Contractor will be required to complete punch list items documented by District, Architect, Inspector and Contractor prior to final payment. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the work by the District shall not constitute acceptance of work not complying with the requirements of the Contract Documents.

## **ARTICLE 12 DISTRICT'S RIGHT TO DO WORK**

Should the Contractor, at any time during the process of construction, fail or refuse to furnish enough materials or workmen to properly execute the work, unless prohibited from so doing through the action of District, Architect, or other authorized official agencies, District, after giving five (5) days written notice to Contractor may, without prejudice to any other rights he may have, proceed to furnish the materials and/or workmen necessary to proceed with or complete the work, and may deduct the cost thereof, together with reasonable expenses arising from such procedure, from any amounts then due or which may thereafter become due to Contractor.

## **ARTICLE 13 DISTRICT'S RIGHT TO TERMINATE CONTRACT**

A. **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:

- (1) Issuance of an order of a court or other public authority having jurisdiction; or
- (2) An act of government, such as a declaration of national emergency.

B. **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.

## ARTICLE 14 TERMINATION BY THE DISTRICT FOR CAUSE

A. **Grounds for Termination.** The District may terminate the Contractor and/or this Contract for the following reasons:

- (1) Persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- (2) Persistently or repeatedly is absent, without excuse, from the job site;
- (3) Fails to make payment to subcontractors, suppliers, materialmen, etc;
- (4) Persistently disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction;
- (5) Fails to provide a schedule or fails or refuses to update schedules required under the Contract;
- (6) Becomes bankrupt or insolvent, including the filing of a general assignment for the benefit of creditors;
- (7) If the Contractor has been debarred from performing work;
- (8) Makes a material misrepresentation to the District or engages in fraud or deceit in connection with Contractor's performance under this Contract; or
- (9) Otherwise is in substantial breach of a provision of the Contract Documents.

B. **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, if any, written notice of seven (7) days, terminate the Contract and may, subject to any prior rights of the surety:

- (1) Take possession of the Project and of all material, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- (2) 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; and
- (3) Complete the work by any reasonable method the District may deem expedient, including contracting with a replacement contractor or contractors.

C. **Payments Withheld.** If the District terminates the Contract for one of the reasons stated in Article 14.A, 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.

D. **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 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.

E. **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, do any of the following:

- (1) 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;
- (2) 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 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
- (3) Initiate procedures to declare the Contractor a non-responsible bidder for a period of two to five 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 Paragraph 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 Paragraph 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 TERMINATION OF CONTRACT BY DISTRICT (CONTRACTOR NOT AT FAULT)**

A. **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.

B. **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.

## **ARTICLE 16 CONTRACT SECURITY - BONDS**

Contractor shall furnish a surety bond in an amount equal to one hundred percent (100 %) of Contract price as security for faithful performance of this Contract and shall furnish a separate bond in an amount at least equal to one hundred percent (100%) of the Contract price as security for payment of persons performing labor and furnishing materials in connection with this Contract. Aforementioned bonds shall be in the form set forth in these contract documents.

## **ARTICLE 17 SUBSTITUTION OF SECURITIES**

Pursuant to the requirements of Public Contract Code section 22300, upon Contractor's request, District will make payment to Contractor of any funds withheld from payments under this Contract if Contractor deposits with the District or in escrow with a California or federally chartered bank acceptable to District, securities eligible for the investment of State Funds under Government Code section 16430 or bank or savings and loan certificates of deposit interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the public agency.

## **ARTICLE 18 INSURANCE REQUIREMENTS**

A. 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:

- (1) Claims for damages because of bodily injury, sickness, disease, or death of any person District would require indemnification and coverage for employee claim;
- (2) 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;
- (3) Claims for damages because of injury or destruction of tangible property, including loss of use resulting therefrom, arising from operations under the Contract Documents;



- (4) 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;
- (5) 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;
- (6) Claims involving Completed Operations, Independent Contractors' coverage, and Broad Form property damage, without any exclusions for collapse, explosion, demolition, underground coverage, and excavating (XCU); and
- (7) Claims involving sudden or accidental discharge of contaminants or pollutants.

**B. 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:

- (1) 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 limit)             | \$1,000,000.00 |
| (b) | Project Specific Aggregate (for this project only) | \$1,000,000.00 |
| (c) | Products and Completed Operations (aggregate)      | \$1,000,000.00 |
| (d) | Personal and Advertising Injury Limit              | \$1,000,000.00 |

- (2) 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 |

- (3) In addition, provide Excess Liability Insurance coverage in the amount of Two Million Dollars (\$2,000,000.00).

**C. Subcontractor Insurance Requirements.** The Contractor shall require its Subcontractors to take out and maintain public liability insurance and property damage insurance required under Article 18.A in like amounts. A "claims made" or modified "occurrence" policy shall not satisfy the requirements of Article 18.A without prior written approval of the District.

**D. Additional Insured Endorsement Requirements.** The Contractor shall name, on any policy of insurance required under Article 18.A, the District, Construction Manager (if any), 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 Article 18.A must be designated in the policy as primary to any insurance obtained by the District. The amount of the insurer's liability shall not be reduced by the existence of such other insurance.

**E. Workers' Compensation Insurance.** During the term of this Contract, the Contractor shall provide workers' compensation 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 adequate 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 18.J and in compliance with Labor Code section 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.

**F. Builder's Risk/ "All Risk" Insurance.** 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.

**G. 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.

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

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

J. **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:

(1) 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."

(2) 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.

(3) 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.

(4) The Contractor and its Subcontractors shall produce a certified copy of any insurance policy required under this Section upon written request of the District.

K. **Compliance.** In the event of the failure of any contractor to furnish and maintain any insurance required by this Article, 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.

L. **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 Section 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.

## **ARTICLE 19 PERFORMANCE AND PAYMENT BONDS**

A. **Bond Requirements.** 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 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.

B. **Surety Qualifications.** Only bonds executed by admitted Surety insurers as defined in Code of Civil Procedure section 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.

C. **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 section 995.660 of the California Code of Civil Procedure and proof of such is provided to the District.

## **ARTICLE 20 DRAWINGS AND SPECIFICATIONS**

A. Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all.

B. Materials or work described in words which so applied has a well known technical or trade meaning shall be deemed to refer to such recognized standards.

C. It is not the intention of the Contract to go into detailed descriptions of any materials and/or methods commonly known to the trade under the "trade name" or "trade term." The mere mention or notation of such "trade name" or "trade term" shall be considered a sufficient notice to Contractor that it will be required to complete the work so named with all its appurtenances according to the best practices of the trade.

D. The naming of any material and/or equipment shall mean furnishing and installing of same, including all incidentals and accessory items thereto and/or labor therefor, as per best practices of the trade(s) involved, unless specifically noted otherwise.

E. Figured dimensions on drawings shall govern, but work not dimensioned shall be as directed. Work not particularly shown or specified shall be the same as similar parts that are shown or specified. Large scale details shall take precedence over smaller scale drawings as to shape and details of construction. Specifications shall govern as to materials, workmanship, and installations procedures. Drawings and specifications are intended to be fully cooperative and to agree. However, if Contractor observes that drawings and specifications are in conflict, Contractor shall promptly notify the District in writing, and any necessary changes shall be adjusted as provided in Article 46 entitled "Changes and Extra Work." The specification calling for the higher quality material or workmanship shall prevail.

F. Specifications and accompanying drawings are intended to delineate and describe the Project and its component parts to such a degree as to enable skilled and competent contractors to intelligently bid upon the work, and to carry said work to a successful conclusion.

G. Drawings and specifications are intended to comply with all laws, ordinances, rules, and regulations of constituted authorities having jurisdiction, and where referred to in the contract documents, said laws, ordinances, rules, and regulations shall be considered as a part of said Contract within the limits specified. The Contractor shall bear all expenses of correcting work done contrary to said laws, ordinances, rules, and regulations if the Contractor knew or should have known that the work as performed is contrary to said laws, ordinances, rules, and regulations and if the Contractor performed same (1) without first consulting the Architect for further instructions regarding said work or (2) disregarded the Architect's instructions regarding said work.

H. Questions regarding interpretation of drawings and specifications shall be clarified by the Architect. Should the Contractor commence work or any part thereof without seeking clarification, Contractor waives any claim for extra work or damages as a result of any ambiguity, conflict, or lack of information.

I. Contractor will be furnished, free of charge, bid sets of permitted documents and specifications. Contractor is to provide reproducible drawings and all additional copies which he requires for his operations at his own expense. He shall maintain an accurate record of all copies made and shall return or otherwise account for all copies at the end of the Project.

## **ARTICLE 21 OWNERSHIP OF DRAWINGS**

Pursuant to Education Code section 17316, all plans, drawings, designs, specifications, and other incidental architectural and engineering work or materials and other contract documents and copies thereof furnished by District are its property. They are not to be used in other work and, with the exception of signed sets of the Contract, are to be returned to the District on request at completion of work.

## **ARTICLE 22 DETAIL DRAWINGS AND INSTRUCTIONS**

A. In case of ambiguity, conflict, or lack of information, Architect shall furnish, with reasonable promptness, additional instructions by means of drawings or otherwise, necessary for proper execution of work. All such drawings and instructions shall be consistent with contract documents, true developments thereof, and reasonably inferable therefrom.

B. Work shall be executed in conformity therewith and Contractor shall do no work without proper drawings and instructions.

C. The Architect will furnish necessary details to more fully explain the work, which details shall be considered as part of the contract documents.

D. Should any details require work and costs beyond those which reasonably should have been included in the contract, Contractor shall give written notice thereof to the District within ten (10) working days of the receipt of same. In case no notice is given to the District within ten (10) working days, it will be assumed the details are reasonable development of the scale drawings. In case notice is given, then the claim will be considered and, if found justified, the District or Architect will either modify the drawings or shall recommend to District a Change Order/ Construction Change Document for the extra work involved.

E. All parts of the described and shown construction shall be of the quality of their respective kinds shown in the Plans or as specified, and the Contractor is hereby advised to use all diligence to become fully informed as to the required construction and finish, and in no case to proceed with the different parts of the work without first obtaining from the Architect some directions and/or drawings as may be necessary for the proper performance of the work.

F. If it is found at any time, before or after completion of the work, that the Contractor has varied from the drawings and/or specifications, in materials, quality, form, or finish, or in the amount or value of the materials and labor used, the District shall issue an order to Contractor: (1) that all such improper work should be removed, remade, and replaced, and all work disturbed by these changes be made good at the Contractor's expense; or (2) that the District deduct from any amount due Contractor, the sum of money equivalent to the difference in value between the work performed and that called for by the drawings and specifications. District shall in its sole discretion determine such difference in value. The District, at its option, may pursue either course.

## **ARTICLE 23 TESTS AND INSPECTIONS**

A. Tests and inspections will comply with California Code of Regulations Title 21, Chapter 4 and Section 42, and Title 24, Chapter 4, Part I. 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.

B. 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. Inspector shall work with Contractor to present incremental approval proposals to DSA.

C. 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.

D. 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 day. Contractor shall provide adequate time for inspections so as to not delay the work. If the Contractor is behind schedule, 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.

E. 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.

F. 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.

G. 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.

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).

H. 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 (“CCD”) to correct the Notice of Non-Compliance. 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.

I. Where such inspection and testing are to be conducted by an independent laboratory or agency, such materials or samples of materials to be tested shall be selected by such laboratory or agency, or District’s representative, and not by Contractor.

J. Contractor shall notify District, a sufficient time in advance, of manufacture of materials to be supplied by him under contract, which must by terms of contract be tested, in order that District may arrange for testing of same at source of supply. Any materials shipped by Contractor from source of supply prior to having satisfactorily passed such testing and inspection, or prior to receipt of notice from said representative that such testing and inspection will not be required, shall not be incorporated in work without prior approval of District and subsequent testing and inspection.

K. Work shall not be covered without the Inspector’s review and the Architect’s knowledge that the work conforms to the requirements of the approved Plans and Specifications. 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 be replaced at the Contractor’s expense without change in the Contract Sum or Time.

L. 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 incorrectly 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.



M. The District will pay costs for all tests and inspections and shall be reimbursed by the Contractor for such costs under the following conditions:

- (1) When such costs are stipulated in the provisions of the Contract documents to be borne by the Contractor;
- (2) When a material is tested or inspected and fails to meet the requirements of the specifications and/or drawings;
- (3) When the source of the material is changed after the original test or inspection has been made and approved.

N. If, in the opinion of the District, subsequent delivery of a tested material seems inferior to, or differs from, the original, said material shall be retested upon written order from the District and, should the material fail to meet the requirements of the specifications and/or drawings, the Contractor shall pay all costs of such tests, but where the material does pass the requirements, the District will pay the cost.

O. All tests and inspections specified for each material shall be made in accordance with the detailed specifications for tests or inspections of the material as specified.

P. If a material is not required to be tested, the District may require the Contractor to furnish a certificate bearing the official and legal signature of the supplier, with each delivery of such material, stating that the material complies with the specifications.

## **ARTICLE 24 STATE AUDIT**

Pursuant to and in accordance with the provisions of Government section 10532, or any amendments thereto, all books, records, and files of District, 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 three (3) years after final payment is made under this Contract. Contractor shall preserve and cause to be preserved such books, records and files for the audit period.

## **ARTICLE 25 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 deemed to be used for the purpose of facilitating the description of the material, process, or article desired shall be deemed to be followed by the words Aor equal.@

B. **Request for Substitution.** Bidder 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 Document. If bidder desires to offer a substitution for a Specified Item, such bidder must make a request in writing on District’s Substitution Request form (“Request Form”) and submit the completed Request Form with their bid. The Request Form must be accompanied by evidence as to whether the proposed substitution:

- (1) Is equal in quality service ability to the Specified Item;
- (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 District;
- (5) Will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts; and
- (6) Will require no change of the construction schedule.

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 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 charges to the District, and if bidder fails to execute the Agreement with the Specified Item(s), bidder's bid bond will be a forfeited.

After the bids are opened, the apparent lowest bidder shall provide within five days of opening such bids, any and all drawings, specification, 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, 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 the sole discretion of District. Any request for substitution which is granted by the District shall be documented and processed through a Change Order/ Construction Change Document. The District may condition its approval of any substitution upon delivery to 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.

## **ARTICLE 26 SAMPLES**

A. Contractor shall furnish for approval, within thirty-five (35) days following award of Contract, all samples as required in specifications together with catalogs and supporting data required by District. This provision shall not authorize any extension of time for performance of this Contract. District shall review such samples, as to conformance with design concept of work and for compliance with information given in contract documents and approve or disapprove same within ten (10) working days from receipt of same.

B. Unless specified otherwise, sampling, preparation of samples and tests shall be in accordance with the latest standards of the American Society for Testing and Materials.

C. Samples of materials and/or articles shall, upon demand of District, be submitted for tests or examinations and consideration before incorporation of same in work is started. Contractor shall be solely responsible for delays due to samples not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples which are of value after testing will remain the property of Contractor.

## ARTICLE 27 PROGRESS SCHEDULE

A. 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.

B. Baseline Schedule Requirements.

(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 with the ten (10) days noted then the District may withhold processing and approval of progress payments.

(2) 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.

(3) Submittals Must Be Incorporated. Contractor shall include submittals as line items in the Baseline Schedule. 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.

(4) No Early Completion. Contractor shall not submit a schedule showing early completion without indicating float time through the date set for Project completion by the 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.

(5) 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.

(6) 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 schedule that is acceptable to the District or Architect, the District reserves the right to utilize the unapproved originally submitted Baseline Schedule (See Article 27.B (9)) 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 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.

(7) Contractor Responsibility Even if Schedule Issues Are Not Discovered. Failure on the part of the District to discover errors or omissions in schedules submitted shall not be construed to be an approval of the error or omission and a flawed schedule is not grounds for a time extension.

(8) Failure to Meet Requirements. Failure of the Contractor to provide proper schedules as required by this Article is a material breach of the Contract and grounds for termination. 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.

(9) Use of an Unapproved Baseline Schedule. If Baseline Schedule submitted is unacceptable to the District (i.e. failing to meet the requirements of Article 27.B) and Contractor does not incorporate or address the written comments to the 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 this Article and incorporate all Article 27.B comments in all updates). However, for purposes of termination pursuant to Article 15, the schedule initially submitted shall be treated as a Baseline Schedule with durations shortened to accommodate all float and other mandatory schedule requirements under Article 27.B as well as incorporating all revisions from District or Architect that are noted.

#### C. Update Schedules.

(1) Updates Shall Be Based on Approved Baseline Schedule. Except in the case where there has not been agreement as to a Baseline Schedule, after there has been agreement as to the Baseline Schedule, the 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 Article 27.B. In the case of utilization of Article 27.B(9) and no Baseline Schedule 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 27.B. Contractor shall be held to the Article 27.B(9) unapproved Baseline Schedule, inclusive of all milestones, adjusted for comments and all required Baseline Schedule inclusions under Article 27.B.

(2) Schedule Updates. Contractor shall update the 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.

(3) 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 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.

## **ARTICLE 28 MATERIALS AND WORK**

A. Except as otherwise specifically stated in this Contract, Contractor shall provide and pay for all materials, labor, tools, equipment, transportation, superintendence, temporary constructions of every nature, and all other services and facilities of every nature whatsoever necessary to execute and complete this Contract within specified time.

B. Unless otherwise specified, all materials shall be new and shall be of the respective kinds and grades as noted or specified.

C. Materials shall be furnished in ample quantities and at such times as to insure uninterrupted progress of work and shall be stored properly and protected as required. Contractor shall be entirely responsible for damages or loss by weather or other causes to materials or work under this Contract.

D. Contractor shall, after award of Contract by District, place orders for materials and/or equipment as specified so that delivery of same may be made without delays to the work. Contractor shall, upon demand from the District, furnish to the District documentary evidence showing that orders have been placed.

E. No material, supplies, or equipment for work under this Contract 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 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, 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.

F. For all material and equipment specified or indicated in the Drawings, the Contractor shall provide all labor, materials, equipment, and services necessary 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 here 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.

## **ARTICLE 29 OBTAINING OF PERMITS, LICENSES AND EASEMENTS**

Permits, licenses, and certificates necessary for prosecution of work shall be secured and paid for by Contractor, unless otherwise specified. All such permits, licenses, and certificates shall be delivered to Architect before demand is made for the certificates of final payment. Contractor shall, and shall require subcontractors to, maintain Contractor's licenses in effect as required by law.

## **ARTICLE 30 ACCESS TO WORK**

District and its representatives shall at all times have access to work wherever it is in preparation or progress. Contractor shall provide safe and proper facilities for such access so that District's representatives may perform their functions.

## **ARTICLE 31 SANITARY FACILITIES**

If applicable, Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law.

## **ARTICLE 32 CLEANING UP**

Contractor at all times shall keep premises free from debris such as waste, rubbish, and excess materials and equipment caused by the work. Contractor shall not leave debris under, in, or about the premises, but shall promptly remove same from the premises. Upon completion of work, Contractor shall clean interior and exterior of building, 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; Contractor shall clean and polish all glass, plumbing fixtures, and finish hardware and similar finish surfaces and equipment and remove temporary fencing, barricades, planking, sanitary facilities and similar temporary facilities from site. If Contractor fails to clean up, District may do so and the cost thereof shall be charged to Contractor.

## **ARTICLE 33 GUARANTEE**

A. In addition to guarantees required elsewhere, Contractor shall, and hereby does guarantee all work furnished on the job against all defects for a period of one year after date of acceptance of work by District and shall repair or replace any and all such work, together with any other work, which may be displaced in so doing that may prove defective in workmanship and/or materials within one year period from date of acceptance without expense whatsoever to District, ordinary wear and tear, unusual abuse or neglect excepted. District will give notice of observed defects to Contractor and Surety with reasonable promptness. Contractor shall notify District upon completion of such repairs or replacement.

B. Contractor Warrants that the WORK (which includes any equipment furnished by Contractor as a part of the materials) shall: (a) Be free from defects in workmanship and material; (b) Be free from defects in any design performed by Contractor; (c) Be new, and conform and perform to the requirements stated in the Specifications, and where detail requirements are not so stated, shall conform to applicable industry standards; and (d) Be suitable for the use stated in the Specifications.

C. The warranty period for discovery of DEFECTIVE WORK shall commence on the date stamped on the Notice of Completion verifying County registration and continue for the period set forth in the Specifications or for one year if not so specified. If, during the warranty period, the WORK is not available for use due to DEFECTIVE WORK, such time of unavailability shall not be counted as part of the warranty period. The warranty period for corrected DEFECTIVE WORK shall continue for a duration equivalent to the original warranty period.

## **ARTICLE 34 DUTY TO PROVIDE FIT WORKERS**

A. Contractor and Subcontractors shall at all times enforce strict discipline and good order among their employees and shall not employ on any person not skilled in the work assigned to such person. It shall be the responsibility of Contractor to ensure compliance with this Article.

B. Any person in the employ of the Contractor or subcontractors whom District may deem unfit shall be excluded from the work site and shall not again be employed on it except with written consent of District. As used in this Article, “unfit” means any person who the District concludes is either not, or 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.

C. Contractor shall take all reasonable steps necessary to insure that any employees of Contractor or any of its subcontractors employees do not use, consume, or work under the influence of any alcohol 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 preclude any of its employees or subcontractor’s employees from bringing any animal onto the Project.

## **ARTICLE 35 FINGERPRINTING**

If applicable, Contractor shall comply with all provisions of either Education Code section 45125.1 or 45125.2. Pursuant to Education Code section 45125.1, Contractor shall conduct criminal background checks of all employees of Contractor assigned to the District, 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 set forth in the bid documents. 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. 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.

Pursuant to Section 45125.2 Contractor shall ensure the safety of pupils by the installation of a physical barrier at the worksite and by continual supervision and monitoring of all these employees by an employee of Contractor whom the Department of Justice has ascertained has not been convicted of a serious or violent felony, as defined in Education Code section 45125.2 (c).

## **ARTICLE 36 WAGE RATES, TRAVEL AND SUBSISTENCE**

A. **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.

**B. 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.

**C. 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.

**D. 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 employer payments for health and welfare, pensions, vacation, travel time and subsistence pay as provided for in Labor Code §1773.1.

**E. 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.

**F. 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.

The Labor Commissioner and 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.

### **ARTICLE 37 PAYROLL RECORDS**

A. Pursuant to §1776 of the Labor Code, each Contractor and 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.

B. All payroll records as specified in Labor Code §1776 of the Contractor and all Subcontractors of any tier 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.
- (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 and 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 of the preparation by the Contractor, Subcontractors, 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.

C. 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.

D. The Contractor or Subcontractor(s) shall file a certified copy of all payroll records with the entity that requested such records within 10 days after receipt of a written request.

E. 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.

F. 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.

G. The Contractor or Subcontractor(s) shall have 10 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 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. The Contractor is not subject to a penalty due to the failure of a Subcontractor to comply with this section.

The responsibility for compliance with this Article shall rest upon the Contractor.

## **ARTICLE 38 WITHHOLDING OF CONTRACT PAYMENTS & PENALTIES**

The District may withhold or delay contract payments to the Contractor and/or any Subcontractor if:

- (1) 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
- (2) 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
- (3) The Contractor or Subcontractor(s) submit incomplete or inadequate payroll records; or
- (4) The Contractor or Subcontractor(s) fail to comply with the Labor Code requirements concerning apprentices; or
- (5) The Contractor or Subcontractor(s) fail to comply with any applicable state laws governing labor on public works projects.

## ARTICLE 39 APPRENTICES

A. **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 at 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 work of 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.

B. **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, in 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 and may apply to any apprenticeship program in the craft or trade that can provide apprentices to the Project site 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. The Contractor or Subcontractor covered by an apprenticeship program's standards shall not be required to submit any additional application in order to include additional public works contracts under that program. "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.

C. **Submission of Contract Information.** Prior to commencing work on the Project, the Contractor and Subcontractors shall submit contract award information to an applicable apprenticeship program 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.

D. **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 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.

E. **Prime Contractor Compliance.** The responsibility of compliance with this Article 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.

#### **ARTICLE 40 PROTECTION OF PERSONS AND PROPERTY**

A. 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 Government Code section 4151(b). Contractor's liability for any injury or damage proximately caused by any "act of God" shall be limited to five percent (5%) of the Contract price pursuant to Government Code section 4150.

B. 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. 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.

C. In an emergency affecting safety of life, of work, or of adjoining property, Contractor, without special instruction or authorization from Architect or District, is hereby permitted to act, at its discretion, to prevent such threatened loss or injury; and Contractor shall so act if so authorized or instructed by Architect or District. District will not hold Contractor liable for damages proximately caused by Contractor's actions if such actions were reasonably necessary to prevent loss of life or injury to person or damage to work or adjoining property. Any compensation claimed by Contractor on account of emergency work shall be determined by agreement.

D. Contractor shall provide such heat, cooling, covering, and enclosures as are necessary to protect all work, materials, equipment, appliances, and tools against damage by weather conditions.

E. 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.

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

- (1) When performing new 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 District regarding the timing of certain construction activities in order to avoid unnecessary interference with school functioning.
- (2) Provide substantial barricades around any shrubs or trees indicated to be preserved.
- (3) Deliver materials to building area over route designated by Architect of District.
- (4) Take preventive measures to eliminate objectionable dust.
- (5) Confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits or directions of Architect; and shall 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 construction site.
- (6) 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.

#### **ARTICLE 41 NON-DISCRIMINATION**

In the performance of the terms of this Contract, Contractor agrees that it will not engage in nor permit such subcontractor as it may employ to engage in unlawful discrimination in employment of persons because of the race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, or sex of such persons.

#### **ARTICLE 42 COST BREAKDOWN AND PERIODICAL ESTIMATES**

A. If applicable, Contractor shall furnish on forms approved by District:

- (1) Within ten (10) days of award of Contract a detailed estimate giving complete breakdown of Contract price for each Project or site; and (2) A periodical itemized estimate of work done for purpose of making partial payments thereon. (3) Within ten (10) days of request of District, a schedule of estimated monthly payments which shall be due Contractor under Contract.

B. Values employed in making up any of these schedules will be used only for determining basis of partial payments and will not be considered as fixing a basis for additions to or deductions from Contract price.

C. Contractor shall include in any breakdown or estimate the cost of final Project record documents, guarantees, warranties, O & M Manuals, photographs, etc.

## **ARTICLE 43 CONTRACTOR CLAIMS & DISPUTES**

A. **Decision of Architect.** “Disputes” or “Claims” as defined in Article 44 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 43.B within ten (10) days after Contractor’s Article 46 request for change or extra work is denied. If there is a construction manager (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 43.B, shall be required as a condition precedent to proceeding with remedies set forth in Article 44 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 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 43.E 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/ Construction Change Document or directive for which approval has not been provided.

B. **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 of the nature and amount of the Dispute. 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.

C. **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.

D. **Actions if Not Resolved.** If a Dispute has not been resolved pursuant to Article 43.B, 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 43.B.

E. **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 43.D. 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 44.

F. **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.

G. **Claims for 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 50. Upon completion of the procedures set forth under Article 50, Contractor must then comply with the requirements in this Article including those set forth under Article 44.

#### **ARTICLE 44 CLAIMS PROCEDURES & REQUIREMENTS**

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 this Article 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 based on the actual costs incurred and to reduce the uncertainty in resolving Disputes and Claims with limited information.

A. **Procedures and Requirements Applicable to all claims.**

(1) 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: (a) a time extension, including, without limitation, for relief from damages or penalties for delay assessed by the District under the Contract; (b) 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.

(2) 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.

(3) 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 43.E, 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 decision of the Architect or the passage of time under Article 43.E, 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 43.A through 43.E.

The Formal Notification of Claim must be presented as follows:

- a. The term “Claim” must be at the top of the page in no smaller than 20 point writing.
- b. All documentation submitted pursuant to this Article to the Architect shall be submitted with the “Claim.”
- c. A stack of documents, copy of all Project documents, or the submission of random documents shall not constitute an adequate reference to supporting documentation.
- d. Any additional or supporting documentation that Contractor believes is relevant should be submitted at this time.

(4) 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:

- a. Cover letter.
- b. Summary of factual basis of Claim and amount of Claim.
- c. Summary of the basis of the Claim, including the specific clause and section under the Contract under which the Claim is made.
- d. Documents relating to the Claim, including:
  - (i) Specifications sections in question.
  - (ii) Relevant portions of the plans/drawings.
  - (iii) Applicable Clarifications (RFI's).
  - (iv) Other relevant information, including responses that were received.
  - (v) Contractor Analysis of Claim merit including Contractor's analysis of any Subcontractor Claims that are being passed through, any analysis performed by outside consultants, and any legal analysis that Contractor deems relevant.
  - (vi) Break down of all costs associated with the Claim. 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 50 shall be included along with a chronology of events and related correspondence.
  - (vii) Applicable daily reports and logs. 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.
  - (viii) 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). 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. 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. 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.

(6) Certification: The Contractor (and subcontractors, if applicable) shall submit with the claim a certification under penalty of perjury:

- a. That the Contractor has reviewed the Claim and that such Claim is made in good faith;
- b. Supporting data are accurate and complete to the best of the Contractor's knowledge and belief;
- c. The amount requested accurately reflects the amount of compensation for which the Contractor believes the District is liable; and
- d. That the Contractor is familiar with Government Code section 12650 et seq. and Penal Code section 72, and that false claims can lead to substantial fines and/or imprisonment.

(7) 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.

(8) 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.

(9) 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.

(10) 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.

(11) If the Contractor disputes the District's written response, or if the District fails to respond to a Claim issued pursuant to this Article 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.

(12) 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 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 44.D.

(13) For purposes of this Article, 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.

(14) Unless otherwise agreed to by the District and the Contractor in writing, the mediation conducted pursuant to this Article shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(15) 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 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 44.C below.

(16) 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 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, shall not constitute an adverse finding with regard to the merits of the Claim or the responsibility or qualifications of the Contractor.

(17) 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.

(18) 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.

(19) The Contractor's Claim shall be denied if it fails to follow the requirements of this Article

(20) 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

**B. Claims Procedures in Addition to Government Code Claim.** Nothing in the Disputes and Claims procedures set forth in Articles 43 and 44 or other provisions in the General Conditions shall act to waive or relieve the Contractor from meeting the requirements set forth in Government Code section 900 et seq.

**C. Binding Arbitration of Individual Claim Issues.** At the District's sole option, the District may submit individual disputes, or claims, to binding arbitration and Contractor agrees to the resolution determined for each individual dispute by Arbitrator, including resolution of time and delays. If binding arbitration is utilized, such resolution is a full and final resolution of the particular claim or dispute. Under no circumstances may the Contractor stop work, rescind its contract or otherwise slow the progress of work during resolution of individual claims in binding Arbitration. 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 individual items by the District prior to Completion of the Project.

**C. Resolution of Disputes in Court of Competent Jurisdiction.** If Claims are not resolved under the procedure set forth and pursuant to Articles 43 and 44, such Claim or controversy shall be submitted to a court in the county of competent jurisdiction after the Project has been completed, and not before.

**E. 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.

## ARTICLE 45 PAYMENTS TO CONTRACTOR

A. Unless otherwise specified, each month within thirty (30) 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. 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 final 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.

B. Before payment is made hereunder, the District will review the request for progress payment with District and Inspector for verification that the work for which payment is requested has been performed in accordance with the Terms of the Contract.

C. District and Inspector shall sign the request for payment as verification that the work has been performed. It is understood moreover, that signature of the Inspector and Architect shall not be conclusive upon District, but merely advisory.

D. Upon request by the District, Contractor shall provide lien releases or partial lien releases for payments previously made. Contractor shall not be entitled to any payment for WORK performed if Contractor has not complied with any lawful direction from the District or has failed to provide lien releases as requested.

E. Prior to final payment, Contractor and each Subcontractor shall certify that the Project does not contain any asbestos containing materials.

F. After completion of the WORK, Contractor shall make a demand for final payment. The demand for final payment shall identify all disputed and undisputed amounts due under the CONTRACT and, all claims for compensation under or arising out of this CONTRACT. The Contractor's negotiation of the payment of the final amount shall constitute a waiver of all amounts due under the CONTRACT and all claims against District under or arising out of this CONTRACT except those identified by Contractor in writing, and unsettled before Contractor's negotiation of final payment. The final payment, if unencumbered, shall be made thirty-five (35) calendar days after recordation of the Notice of Completion by the County Registrar. Acceptance will be made only by ACTION OF THE GOVERNING BOARD.

G. In accordance with Public Contract Code section 7100, payments by the District to the Contractor for any and all undisputed amounts is contingent upon 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 44 and 46.

H. No payment by District hereunder shall be interpreted so as to imply that District has inspected, approved, or accepted any part of the WORK.

#### ARTICLE 46 CHANGES AND EXTRA WORK

A. District may, as provided by law and without affecting the validity of this Contract, order changes, modifications, deletions and extra work by issuance of written Change Orders/ Construction Change Documents from time to time during the progress of the Project, Contract sum being adjusted accordingly. All such work shall be executed under conditions of original Contract except that any claim for an extension of time caused thereby shall be adjusted at time of ordering such change.

B. In giving instructions, Architect shall have authority to make minor changes in work, not involving change in cost, and not inconsistent with purposes of the building. Otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order from District, authorized by action of the Governing Board and no claim for addition to Contract sum shall be valid unless so ordered.

C. The following format shall be used as applicable by the District and the Contractor to communicate proposed additions and deductions to the Contract:

|  | <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 Sub-contractor, not to exceed fifteen percent (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   | _____        | _____         |

|     |            | <u>EXTRA</u> | <u>CREDIT</u> |
|-----|------------|--------------|---------------|
| (j) | TOTAL      | _____        | _____         |
| (k) | Time/ Days | _____        | _____         |

D. If the Contractor should claim that any instruction, request, drawing, specification, action, condition, omission, default, or other situation obligates the District to pay additional compensation to the Contractor or to grant an extension of time for the compensation of the Contract, or constitutes a waiver of any provision in the Contract, Contractor shall notify the District, in writing, of such claim within ten (10) calendar days from the date Contractor has actual or constructive notice of the factual basis supporting the claim. The Contractor's failure to notify the District within such ten (10) calendars day period shall be deemed a waiver and relinquishment of such a claim against the District. If such notice be given within the specified time, the procedure for its consideration shall be as stated above in this Article.

E. If Contractor does not remove such work 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.

#### **ARTICLE 47 COMPLETION**

A. The Project will be considered complete when all required contract work is completed, all punch list items have been completed and a Notice of Completion has been recorded for the Project. The work may only be accepted as complete by action of the Governing Board.

#### **ARTICLE 48 ADJUSTMENTS TO CONTRACT PRICE**

A. 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) days written notice to Contractor and without prejudice to any other remedy it may have, make good such deficiencies.

B. 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 injured or not done in accordance with Contract provisions, an equitable reduction in Contract price shall be made therefore.

#### **ARTICLE 49 CORRECTION OF WORK**

A. Should it be considered necessary or advisable by the District at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

B. Contractor shall promptly remove from premises all work identified by District as failing to conform to Contract, whether incorporated or not. Contractor shall promptly replace and re-execute its

own work to comply with entrant documents 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.

C. If Contractor does not remove such work 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) days time thereafter, District may, upon ten (10) 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.

## **ARTICLE 50 EXTENSION OF TIME - LIQUIDATED DAMAGES**

A. The 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. It is expressly understood that time is of the essence and that the Contractor must complete the Project within the Contract Time specified in the Agreement. Contractor shall be assessed the sum (set forth in the Agreement Form) per day as liquidated damages for each and every day the work required under this contract remains unfinished past the time for completion, as set forth in the Agreement, and any extensions of time granted by the District to the Contractor under the terms of the contract documents and pursuant to Section 53069.85 of the Government Code. For purposes of this Article, the work shall be considered "complete" in accordance with the provisions of Article 47, "COMPLETION", except that the work may be considered complete without formal acceptance by the Governing Board so long as the board, at its next regularly scheduled meeting, accepts the work.

B. Contractor shall not be charged for liquidated damages, as set forth above, because of any delays in completion of work which are not the fault or negligence of Contractor, including but not restricted to: acts of God as defined in Public Contract Code section 7105, acts of public enemy, fires, floods, epidemics and quarantine restrictions. Contractor shall, within ten (10) calendar days of beginning of any such delay (unless District grants in writing a further period of time to file such notice prior to date of final settlement of the Contract), 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. The District's finding of fact thereon shall be final and conclusive on the parties hereto. 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.

## **ARTICLE 51 PAYMENTS WITHHELD**

A. In addition to amount which District may retain under Article 47 entitled "COMPLETION" and Article 45 entitled "PAYMENTS TO CONTRACTOR", District may withhold a sufficient amount or amounts of any payment or payments otherwise due to Contractor, as in its judgment may be necessary to cover:

- (1) Payments which may be past due and payable for just claims against Contractor or any subcontractors, or against and about the performance of work on the Project under this Contract, including, without limitation, payments made pursuant to the Article 45 entitled "PAYMENTS BY CONTRACTOR";
- (2) The cost of defective work which Contractor has not remedied;
- (3) Liquidated damages assessed against Contractor;
- (4) Penalties for violation of labor laws;

- (5) The cost of materials ordered by the District pursuant to the Article 28 entitled "MATERIALS AND WORK";
- (6) The cost of completion of this Contract if there is reasonable doubt that this Contract can be completed for the balance then unpaid to Contractor;
- (7) Site clean-up as provided in Article 32 entitled "CLEANING UP";
- (8) Amount necessary to satisfy any and all liens against District. Contractor shall provide release of all liens prior to final payment;
- (9) Damages to another Contractor;
- (10) Payments to indemnify, defend, or hold harmless the District;
- (11) Any payments due to the District including but not limited to payments for failed tests, utilities or imperfections; or
- (12) Inspector sign-off of each item in the DSA 152 Project Inspection Card.

B. If the Contractor, at its own expense, removes the reason for withholding, then payment shall be made for amount withheld.

C. District may apply such withheld amount or amounts to payment of such claims or obligations at its discretion. 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.

D. As an alternative to payment of such claims or obligations, District, in its sole discretion, may reduce the total Contract price as provided in Article 48 entitled "ADJUSTMENTS TO CONTRACT PRICE."

E. Payment by the District shall be without prejudice to any other action by the District to recover damages.

## **ARTICLE 52 EXCISE TAXES**

If under Federal Excise Tax Law any transaction hereunder constitutes a sale on which a Federal Excise Tax is imposed and the sale is exempt from such Federal Excise Tax because it is a sale to a State or Local Government for its exclusive use, District, upon request, will execute documents necessary to show (1) that District is a political subdivision of the State for the purposes of such exemption and (2) that the sale is for the exclusive use of District. No Federal Excise Tax for such materials shall be included in any bid price.

## **ARTICLE 53 TAXES**

Bid price is to include any and all applicable sales taxes or other taxes that may be due in accordance with Section 7051 of the Revenue and Taxation Code; Regulation 1521 of the State Board of Equalization or any other tax codes that may be applicable.

## **ARTICLE 54 NO ASSIGNMENT**

Contractor shall not assign this Contract or any part thereof.



## **ARTICLE 55 NOTICE AND SERVICE THEREOF**

A. Any notice from one party to the other or otherwise under Contract shall be in writing and shall be dated and signed by party giving such notice or by a duly authorized representative of such party. Any such notice shall not be effective for any purpose whatsoever unless served in one of the following manners:

(1) If notice is given to District, by personal delivery thereof to District or by depositing same in United States mail, enclosed in a sealed envelope addressed to District, and sent by registered or certified mail with postage prepaid; (2) If notice is given to Contractor by personal delivery thereof to said Contractor or to Contractor's superintendent at site of Project, or by depositing same in United States mail, enclosed in a sealed envelope addressed to said Contractor at its regular place of business or at such address as may have been established for the conduct of work under this Contract, and sent by registered or certified mail with postage prepaid; (3) If notice is given to surety or other person by personal delivery to such surety or other person or by depositing same in United States mail, enclosed in a sealed envelope, addressed to such surety or person at the address of such surety or person last communicated by surety or other person to party giving notice, and sent by registered or certified mail with postage prepaid.

## **ARTICLE 56 NO WAIVER**

The failure of District in any one or more instances to insist upon strict performance of any of the terms of this Contract or to exercise any option herein conferred shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option on any future occasion.

## **ARTICLE 57 HAZARDOUS MATERIALS**

In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop work in the area affected and report the condition to the District and Architect in writing. The work in the affected area shall not thereafter be resumed except by written agreement of the District and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless, by written agreement of the District and Contractor, or in accordance with final determination by the Architect.

## **ARTICLE 58 DISTRICT'S RIGHT TO CARRY OUT THE WORK**

If Contractor defaults or neglects to carry out the work in accordance with the contract documents or fails to perform any provision of this Contract, the District may, after five (5) calendar days' written notice to Contractor and without prejudice to any other remedy he may have, made good such deficiencies. In such case an appropriate Change Order/ Construction Change Document shall be issued deducting from the payments then or thereafter due Contractor the cost of correcting such deficiencies, including the cost of the Architect's additional service made necessary by such default, neglect or failure. If the payments then or thereafter due Contractor are not sufficient to cover such amount, then Contractor shall pay the difference to the District within five (5) calendar days.

## **ARTICLE 59 INDEMNIFICATION**

See Article 5 of the Agreement Form.

## **ARTICLE 60 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, chrysolite, amosite, anthophyllite, tremolite, and actinolite. Any or all material containing greater than one-tenth of one percent (1%) asbestos shall be defined as asbestos-containing material. 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.

## **ARTICLE 61 LIEN RELEASES**

Contractor shall, at its own cost, defend, indemnify and hold harmless the District, its officers, agents, employees, assigns, and successors in interest, from and against any and all liability, damages, losses, claims, demands, actions, causes of action, and costs including attorney's fees and expenses, or any of them, arising from or attributable to a lien or stop notice filed and/or served in connection with the work.

## **SUPPLEMENTARY GENERAL CONDITIONS**

Division 1 Forms

**IMMEDIATE CONSTRUCTION CHANGE DIRECTIVE NO.**

PROJECT: \_\_\_\_\_

TO: \_\_\_\_\_

You are hereby directed to provide the extra work necessary to comply with this ICD.

DESCRIPTION OF CHANGE: \_\_\_\_\_

\_\_\_\_\_

COST (This cost shall not be exceeded): \_\_\_\_\_

TIME FOR COMPLETION: \_\_\_\_\_

**NOTE:**

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 revisions within. If applicable, the Contract Sum and Contract Time will be adjusted accordingly. **CONTRACTOR SHALL PROCEED WITH WORK SET FORTH IN THIS ICD IMMEDIATELY UPON RECEIPT OR THE DISTRICT MAY EITHER HOLD THE CONTRACTOR IN DEFAULT PURSUANT TO THE GENERAL CONDITIONS.**

\_\_\_\_\_  
Architect

\_\_\_\_\_  
District

## CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT: \_\_\_\_\_

TO: \_\_\_\_\_

As the Architect for the Project described above, the Project has reached Substantial Completion. Substantial Completion is not reached unless and until each of the following three (3) conditions have been met: (1) all contractually required items have been installed with the exception of only minor and punch list items; (2) all fire/life safety systems have been installed, and are working and signed off on the DSA Form 152 Inspection Card, all building systems including mechanical, electrical and plumbing are all functioning; and (3) the Project is fit for occupancy and its intended use

I certify that the Project has reached Substantial Completion as defined above on the following date:  
\_\_\_\_\_.

\_\_\_\_\_  
Architect

PART 1 - GENERAL

1.01 PROJECT/WORK IDENTIFICATION

- A. General: The work is comprised of the modernization of Tom Hawkins Elementary School Administration Building for the Jefferson School District, as indicated on the contract documents prepared by PJHM Architects, Inc.
- B. Contract Documents: Indicates the work of the contract and related requirements and conditions that have an impact on the project. This includes, but is not necessarily limited to that shown on the drawings and specified herein.
  - 1. Work to be performed throughout the site within or about the property line of the project.
- C. Summary of References: Work of the Contract can be summarized by references to the Contract, Agreement, General Conditions, Special Conditions, Specification Sections, Drawings, addenda and modifications to the contract documents issued subsequent to the initial printing of this project manual and including, but not necessarily limited to, printed material referenced by any of these. It is recognized that work of the contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions and other forces outside the contract documents.

1.02 ABBREVIATED WRITTEN SUMMARY:

Briefly and without force and effect upon the contract documents, the work of the contract can be summarized as follows:

- A. Building Modernization
  - 1. Selective demolition and modernization of the existing administration building

Work includes reorganization of rooms, new finishes, removal of one restroom, minor work to HVAC, electrical, data and sprinkler system.

1.03 PERFORMANCE REQUIREMENTS FOR CONSTRUCTION AND COMPLETED WORK

- A. General: The Contract Documents indicate the intended occupancy and utilization of the buildings and its individual systems and facilities. Compliance with governing regulations is intended and required for the work and for the Owner's occupancy and utilization.

## PART 2 - EXECUTION

### 2.01 PERFORMANCE

- A. Provide quality workmanship for the related work indicated and specified herein, meeting the quality standards of the trades affected by the scope of work per these contract documents.
- B. Time Line
  - 1. Refer to the Agreement for construction time, which shall start as of the date specified in the initial letter "Notice to Proceed" from the Architect and/or the Owner to the Contractor and end with the date of acceptance of work by the Owner.
  - 2. Substantial completion of work or a designated portion thereof is the date certified by the architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the work or designated portion thereof for the use intended.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Included: The General Contractor shall provide administrative service and supervisory requirements necessary for the coordination of work to insure orderly progress and timely completion of the work in conformance with the design and the contract documents within the time line specified. Work of the project includes but not necessarily limited to the following:
  - 1. Coordination meetings
  - 2. Administrative and supervisory personnel
  - 3. Interface subcontractors/manufacturers/time line
  - 4. Record documentation
  - 5. Material test and inspection
  - 6. General Construction/Installation provisions
  - 7. Maintain safe, clean conditions
  - 8. Conservation and salvage
- B. Related Requirements: The General Provisions of the Contract Documents.

1.02 QUALITY ASSURANCE

- A. Provide administrative staff and employees who are thoroughly experienced to provide quality standards and craftsmanship, who are completely familiar with the California Building Code and the specified requirements needed for the performance and completion of the work indicated and specified herein.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Equipment Access: To avoid conflict, the contractor shall establish and provide adequate area to provide secure storage for handling of stored products away from ongoing activities of the work. Provide access and route of handling products to avoid damage.
- B. Provide secure protection of work and materials against damage. Manufactured products shall be stored per manufacturer's recommendations on product handling, storage and protection.
- C. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
  - 1. Maintain packaged materials with seals unbroken and labels intact until time of use.
  - 2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements.



- D. The architect may reject as non-complying such material and products that do not bear identification satisfactory to the architect as to manufacturer, grade, quality and other pertinent information.

#### 1.04 ADMINISTRATIVE/SUPERVISORY PERSONNEL

- A. General: Prepare a written memorandum on required coordination activities. Include such items as required notices, reports and attendance at meetings. Distribute this memorandum to each entity performing work at the project site. Prepare similar memorandum for separate contractors where interfacing of their work is required.
- B. Coordination Drawings: Prepare coordination drawings where work by separate entities requires fabrication off-site of products and materials which must accurately interface. Coordination drawings shall indicate how work shown by separate shop drawings will interface, and shall indicate sequence for installation. Comply with all requirements of the "Submittals" section.
- C. Weekly Coordination Meetings: Hold weekly general project coordination meetings at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes such as regular project meetings and special pre-installation meetings. Request representation at each meeting by every party currently involved in coordination or planning for the work of the entire project. Conduct meetings in a manner which will resolve coordination problems. Record results of the meeting and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- D. Verified Reports: Contractor shall make a duly Verified Report to Division of the State Architect per 4.336, Title 24, Part 1.

#### 1.05 LIMITATIONS ON USE OF THE SITE

- A. General: Limitations on site usage as well as specific requirements that impact site utilization are indicated on the drawings. In addition to these limitations and requirements administer allocation of available space equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.
- B. Burial of Waste Materials: Do not dispose of organic and hazardous materials on site, either by burial or by burning without the express written consent of the architect.

#### 1.06 SPECIAL REPORTS

- A. General: Submit special reports directly to the Owner within one day of an occurrence. Submit a copy of the report to the architect/engineer and other entities that are affected by the occurrence.

- B. Reporting Accidents: prepare and submit reports of significant accidents, at site and anywhere else work is in progress. Record and document data and actions. For this purpose, a significant accident is defined to include events where personal injury is sustained, or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 – EXECUTION

### 3.01 GENERAL INSTALLATION PROVISIONS

- A. Pre-Installation Conferences: Hold a pre-installation meeting at the project site well before installation of each unit of work which requires coordination with other work. Installer and representatives of the manufacturers and fabricators who are involved in or affected by that unit of work, and with its coordination or integration with other work that has preceded or will follow shall attend this meeting. Advise the Architect/Engineer of schedule meeting dates.
1. At each meeting review progress of other work and preparations for the particular work under consideration.
  2. Record significant discussions of each conference, and record agreements and disagreements, along with the final plan of action. Distribute the record of meeting promptly to everyone concerned, including the owner and Architect/Engineer.
  3. Do not proceed with the work if the pre-installation conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene pre-installation conference at the earliest feasible date.
- B. Installer's Inspection of Conditions: Require the Installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The Installer shall report all unsatisfactory conditions in writing to the Contractor. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- C. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents.

Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

Provide attachment and connection devices and methods for securing work. Secure work true to line and level, and within recognized industry tolerances. Allow expansion and building movement. Provide uniform joint width in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable visual-effect choices to the Architect/Engineer for final decision.

Recheck measurements and dimensions of the work, as an integral step of starting each installation.

Install each unit-of-work during weather conditions and project status that will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration.

Coordinate enclosure of the work with required inspections and tests, so as to minimize the necessity of uncovering work for that purpose.

- D. Mounting Heights: Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. Refer questionable mounting height choices to the Architect/Engineer for final decision.

### 3.02 CLEANING AND PROTECTION

- A. General: During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion.

Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- B. Limiting Exposures of Work: To the extent possible through reasonable control and protection methods, supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period.

### 3.03 CONSERVATION AND SALVAGE

- A. General: It is a requirement for supervision and administration of the work that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials. In addition, maximum consideration shall be given to salvaging materials and equipment involved in performance of the work but not incorporated therein in accordance with IUSD standard 5.408.3. Refer to other sections for required disposition of salvage materials that are the Owner's property (Change Order procedure).

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide field engineering services as required for the proper locations and completion of the work, so indicated on the drawings and specified herein. Work shall include, but not necessarily be limited to the following:
  - 1. Establish location of the property line, easements, benchmark, building locations and corners, all site improvements, utilities, and maintain (vertical/horizontal) lines of levels.
  - 2. Reset property line stakes and benchmark as required.
  - 3. Sign certified documentation of complete project layout per the Contract Drawings.

1.02 RELATED REQUIREMENTS

- A. Related work and documents affecting work of this section include, but are not necessarily limited to, the General Provisions of the Contract Documents.
- B. Described in the General Conditions, the Owner will furnish survey describing the physical characteristics of the site and incorporate as a part of the civil drawings herein.

1.03 QUALITY ASSURANCE

- A. Work of this section shall be performed by a California registered professional civil engineer as required per the General Conditions.
- B. Provide adequate number of surveying professionals who are thoroughly experienced as necessary to provide the services required in laying out the work in conformance with the requirements of the Contract Documents.

1.04 SUBMITTAL

- A. Certification, signed by the Contractor's retained field engineer, certifying that all elevations, locations of structures and site improvements are in conformance or non-conformance with the Contract Documents.

PART 2 - PRODUCTS (NOT APPLICABLE)

## PART 3 - EXECUTION

### 3.01 PROCEDURES

- A. The Contractor shall coordinate this work with the requirements for documentation of record drawings as required per the Special Conditions and other sections of Division 1 of these specifications.
- B. In addition to the Contractor's responsibilities:
  - 1. Locate and protect control and reference points during the progress and completion of the work. Reset if required.
  - 2. Make no changes without the Architect's approval. Define changes if so required.
  - 3. Promptly advise the Architect when changes are required due to site conditions for prompt direction.
  - 4. Establish building locations and elevations, coordinate with Aurora Modular.
  - 5. Locate easements, all on-site improvements and utilities.
  - 6. Define locations of paving, walks, set initial grades, at changes, slopes and at corners.
- C. Final Property Survey.
  - 1. Before substantial completion, prepare a final property survey showing significant features (real property) that have resulted from construction of the project. Include on the survey a certification, signed by the civil engineer to the effect that principal lines and levels of the project are accurately positioned as shown on the survey.
  - 2. Submit three (3) copies of final property survey.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Provide, install, and finish of products specified under options and conditions for substitutions stated in this section of specifications and as needed for a complete, proper, and operable installation.

1.02 SYSTEM DESCRIPTIONS

A. Products List

1. Submit six (6) copies or (1) digital (.pdf) version of the complete list of major products and systems which are proposed for installation. Include Substitution Request Form attached to the end of this specification. Digital submissions may be accepted at ARCHITECT's discretion.
2. Tabulate products and systems by specifications section number and title.
3. For products and systems specified only by reference standards, list for each such product or system:
  - a. Name and address of manufacturer or fabricator.
  - b. Trade name.
  - c. Model or catalog designation, including date.
  - d. Manufacturer's or fabricator's data and literature on: Reference standards, performance test data, certifications.

B. Specified Options

1. For products specified only by reference standard, select product meeting that standard, by any manufacturer.
2. For products specified by naming several products or manufacturers, select any one (1) of the products or manufacturers named.
3. For products specified by naming one (1) or more products or manufacturers and stating, "or equal", submit a request for substitutions for any product or manufacturer which is not specifically named, but only after submitting bid on specified products and systems.

- C. Submission of Data Substantiating a Request for a Substitution of "An Equal Item"
1. A substitution request must be submitted to the OWNER not later than seven (7) days prior to the Bid Deadline specified in the Notice Inviting Bids. The OWNER will not consider any substitution request received thereafter, except to the extent provided in the General Conditions. Concurrently with submitting a substitution request, the Bidder must provide all information required pursuant to the General Conditions to substantiate the request. The OWNER shall not be required to make a determination in regard to any substitution request and/or substantiating information prior to award of the Contract. If the OWNER gives a Notice of Award for the Contract to a Bidder, but subsequently disapproves a substitution proposed by that Bidder, the Bidder must provide the Specified Item in accordance with the Contract Documents and at no additional cost to the OWNER.
  2. It is the intent of the OWNER and ARCHITECT to have this project constructed with materials, products and systems originally designed and specified into project. This opportunity to request substitutions is not for the convenience of bidders or CONTRACTORS to submit bids for materials, products and systems which may be more familiar to them or having a lesser cost.
  3. Submit separate request for each substitution item. Support each request with an explanation for the request, and include:
    - a. Complete data substantiating compliance of proposed substitutions with requirements stated in contract documents:
      1. Product identification, including manufacturer's name and address.
      2. Manufacturer's literature; identify: Product description, reference standards, performance and test data.
      3. Samples, as applicable.
      4. Name and address of similar projects on which product has been used, and date of each installation, as well as servicing agency and installer.
    - b. Itemized comparison of the proposed substitution with products specified, listing significant variations.
    - c. Data relating to changes in the construction schedule.
    - d. Any effect of substitution on separate contracts.
    - e. Any effect of substitution on in-place construction or other materials and systems to be installed.

- f. Accurate cost data comparing proposed substitution with product specified.
  - g. Designation of required license fees or royalties.
  - h. Designation of availability of maintenance services and sources of replacement materials.
- 4. Substitutions will not be considered for acceptance when:
  - a. Lesser material cost is the sole reason for request.
  - b. They are indicated or implied on shop drawings or product data submittals without formal request.
  - c. Acceptance may require revision of contract documents.
- 5. Substitute products shall not be ordered or installed without written acceptance and authorization of OWNER and ARCHITECT.
- 6. Substitutions shall be approved by OWNER and ARCHITECT prior to fabrication or use.
- 7. Only the OWNER and ARCHITECT will determine the acceptability of proposed substitutions.

D. Representations

- 1. In making a legitimate, authorized formal request for substitution, represent that:
  - a. A thorough investigation has transpired concerning the proposed product, and it has been determined that it is equal to or superior in all respects to that specified.
  - b. The same warranties or bonds and guarantees will be provided as for that specified.
  - c. Installation of the accepted substitution will be coordinated into the work; and such changes to in-place work, ordered materials and products, or other work to be in progress prior to installation of the requested substitutions, will be performed without any additional cost to OWNER.

E. Duties

- 1. Requests for substitutions must be expeditiously forwarded for consideration per the requirements of the General Conditions.
- 2. Notification of decisions concerning acceptance or rejection will be in writing and are final without need for clarification.

### 1.03 SUBMITTALS

- 1. Refer to section 01 33 00



SUBSTITUTION REQUEST FORM

Date: \_\_\_\_\_

Attn: \_\_\_\_\_

PJHM Architects, Inc.  
24461 Ridge Route Drive, Suite 100  
Laguna Hills, CA 92653

Architect's Project No.: \_\_\_\_\_

Project: \_\_\_\_\_

Permit/Application No.: \_\_\_\_\_

The undersigned requests consideration of the following substitution:

Specified Item: \_\_\_\_\_

(Drawing Sheet/Detail No., Specification Section, Description, etc.)

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Proposed Substitution:

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Statement of Cause:

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Special Note: Modifications to any language contained in this document is unacceptable. If modifications are made, the entire substitution package will be returned without review.

We have attached the following submittal checklist for your use, verify all items are included with your substitution request submittal.

- ☐ Substitution request has been submitted not later than seven (7) days prior to the bid deadline specified in the Notice Inviting Bids.

Notice Inviting Bids Date: \_\_\_\_\_ Substitution Request Date: \_\_\_\_\_

- ☐ Product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the requests with applicable portions of the data clearly identified, manufacturer's literature, samples, names and address of the manufacturer's representative have all been provided.
- ☐ Complete documentation of all regulatory approvals required by the Contract Documents for the proposed substitution.
- ☐ Itemized comparison/analysis of proposed substitution with that of the specified product.
- ☐ Detailed cost summary of the change, if any, to the Contract Sum.
- ☐ Evaluation of the effect of the proposed substitution on the construction schedule and impact on completion date.
- ☐ Description of changes to the Contract Documents which proposed substitution will require for its proper installation.
- ☐ Manufacturer's Warranty comparison between the specified manufacturer and the proposed manufacturer.

The undersigned states that the following paragraphs, unless modified on the attachments, are correct:

- A. The proposed substitution does not affect dimensions shown on the Drawings.
- B. The undersigned will pay all costs for changes to the building design, including engineering design, detailing and construction costs, and LAHJ review/approval fees caused by the requested substitution.
- C. The proposed substitution will have no adverse effect on other trades or specified warranty requirements.
- D. Maintenance and service parts will be locally available 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:

Name: \_\_\_\_\_ Signature: \_\_\_\_\_

Firm/Company: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_ Date: \_\_\_\_\_

Approved by (ARCHITECT):

Approved by (OWNER):

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Signature: \_\_\_\_\_

Date: \_\_\_\_\_ Date: \_\_\_\_\_

(ARCHITECT to include submittal approval stamp)

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE:

- A. Provide all services and coordination to perform all testing, inspection, supervision and reporting specified herein. The District shall pay for any testing related expense if not specified herein. Specific requirements in the respective technical sections are to be done and paid for by the District and reimbursed by the Contractor. Those requirements form a part of the work of this Section.

1.02 GENERAL REQUIREMENTS:

- A. Codes and Standards: Conform to the California Building Code, and any other referred-to codes and standards. In case of conflict between the above and this Section, the more stringent shall govern.
- B. Testing and inspection of new concrete and new reinforcing steel as required per Title 24, Part 2 of 2016 CBC: Concrete per Chapter 19A: materials, quality and inspection.
- C. Testing and inspection of expansion anchors and epoxy anchors per California Department of General Services – DSA – interpretation of Regulation Document: IR 19-1.
- D. Continuous batch plant inspection per 2016 CBC 17A, 1705A.3.3.

1.03 COOPERATION:

- A. Laboratory shall cooperate with all trades whose work affects or is affected by the tests and inspections.
- B. Contractor shall cooperate with and provide testing laboratory opportunity and assistance in taking samples, making field tests and making inspections, where required. Where and if any such testing and inspection is required, the District shall retain and pay directly for such services.
- C. Separation of Contracts: Nothing in this specification shall be a demand of the General Contractor to administrate his subcontractors in any manner or separate, for example, the buying and or installation of any particular work from one subcontractor to another. There are sections in this specification that will express the manner in which the Contractor might obtain the best results or lowest bids.

1.04 ADMINISTRATIVE:

- A. Selection: Owner shall select all testing and inspection agencies and personnel with the advice and approval of the Architect and Structural Engineer and Division of State Architect except as specified hereinafter.

- B. Soils Testing Agency: not required.
  - C. Testing Laboratory: To be Laboratory Evaluation and Approval Program (LEA Program) approved by DSA prior to start of construction.
  - D. Laboratory Inspector: not required.
  - E. Project Inspector: A Class I project inspector employed by the School District shall perform his duties as defined in Sections 4-342 of Title 24, Part 1.03.
- 1.05 REPORTS: Execute reports within fourteen (14) days of conclusion of each procedure and forward separately to: Owner, Architect, Structural Engineer, and Contractor. As referenced in section 4335(d).
- A. Any failure to be reported immediately.
- 1.06 PAYMENT: Per General Conditions.
- 1.07 PROCEDURES: Specific requirements for tests and inspections required for each material are specified in the technical sections for the material requiring tests or inspections.

PART 2 – PRODUCTS                      Not required, this section.

PART 3 – EXECUTION                      Not required, this section.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
  - 1. Submittal Procedures.
  - 2. Shop Drawings.
  - 3. Product Data.
  - 4. Samples.
  - 5. Manufacturers' Instructions.
  - 6. Manufacturers' Certificates.
  - 7. Coordinated Drawings.

1.02 SUBMITTALS

- A. Procedures
  - 1. CONTRACTOR shall submit a Schedule of Submittals, listing their required submission and review dates to the ARCHITECT for review and acceptance. The schedule shall allow sufficient time for checking by the ARCHITECT. In addition, the submittal schedule shall be incorporated into and coordinated with the construction progress schedule. Additional service fees will be required, paid by the CONTRACTOR at no cost to the OWNER, to the ARCHITECT for ARCHITECT's review of out of sequence submittals, excessive resubmittal attempts, expedited review requests, and submittals not in conformance with the submittal schedule time limits.
  - 2. Transmit separate request for each submittal directly to the ARCHITECT.
    - a. Bind submittals sturdily, neatly label covers.
    - b. Include ARCHITECT'S job number as it appears on Contract Documents.
    - c. Include LAHJ application or approval numbers.
    - e. Digital submissions will be accepted at the discretion of the ARCHITECT.
  - 3. Sequentially number the transmittal forms. Re-submittals are to have original number with the letter 'R' followed by revision number. Example Naming: Submittal 07 92 00 R2

4. Identify Project, CONTRACTOR, subcontractor or supplier; pertinent Drawing sheet and detail number(s) and specification section number, as appropriate.
  - a. Provide name and telephone number of individual who may be contacted for further information.
5. Apply CONTRACTOR'S dated stamp with CONTRACTOR'S original signature or initials affixed thereto, certifying that review, verification of Products required, field dimensions, adjacent construction Work and coordination of information is in accordance with the requirements of the Work and Contract Documents. Stamped signatures or initials are not acceptable.
6. Schedule submittals to expedite the Project. Coordinate submission of related items.
  - a. Make all submittals in accordance with the progress schedule and far enough in advance of scheduled dates of installation to provide required time for reviews for securing necessary approvals for possible revision and re-submittal and for placing orders and securing delivery.
7. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
8. State effect of substitution on construction schedule and changes required in other work or products.
9. Provide space for CONTRACTOR and ARCHITECT review stamps.
10. Revise and re-submit submittals as required, identify all changes made since previous submittal with revision clouds and revision delta symbols.
11. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
12. Determine and verify all field dimensions and conditions, materials, catalog numbers and similar data.
13. Coordinate as required with all trades and all public agencies involved.
14. Unless otherwise specifically authorized by ARCHITECT, make all submittals in groups pertaining to specification sections, containing all associated items. ARCHITECT will reject partial submittals as not complying with the provisions of this section.

B. Product Data

1. Submit eight (6) copies or (1) digital (.pdf).
2. Mark each to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information unique to this Project.
3. After review, distribute and provide copies for Record Documents.

C. Shop Drawings

1. Submit newly prepared information, drawn to accurate scale. Highlight, encircle or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project will not be approved as Shop Drawings.
2. Shop Drawings shall include fabrications and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
  - a. Dimensions.
  - b. Identification of products and materials included.
  - c. Compliance with specified standards.
  - d. Notation of coordination requirements.
  - e. Notation of dimensions established by field measurement.
3. Sheet Size: Except for templates, patterns and similar full-size drawings, submit Shop Drawings on sheets at least 8½ inch x 11 inches, but not larger than 30-inch x 42-inch.
4. The CONTRACTOR shall review, stamp with his approval as herein required, and submit with reasonable promptness and in orderly sequence, in accordance with the submittal schedule, all shop drawings required by the Contract Documents or subsequently by the ARCHITECT as covered by modifications. Shop drawings shall be properly identified. At the time of submission, the CONTRACTOR shall inform the ARCHITECT in writing of any deviation in the shop drawings from the requirements of the Contract Documents.
5. Stamp: Each page of shop drawings shall bear the CONTRACTOR'S stamp, which shall signify the CONTRACTOR'S representation that he/she has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained in the shop drawings. Each stamp shall be accompanied by a wet signature of the CONTRACTOR who may be contacted for information. Stamped signatures or initials are not acceptable.



6. Method of Review: Make initial submittal of eight (6) hard copies of the shop drawings to the ARCHITECT. Comments or corrections will be noted and returned to the CONTRACTOR, who shall identify all changes made since the previous submittal and re-submit in the same manner. When reviewed, the shop drawings will be stamped and returned to the CONTRACTOR who shall make distribution of copies to his/her subcontractors.
7. The ARCHITECT will review shop drawings with reasonable promptness so as not to cause any delay, but only for conformance with the design concept of the project and with the information given in the Contract Documents. The ARCHITECT'S favorable review of a separate item shall not indicate acceptance of an assembly in which the item functions.
8. Submittal of shop drawings to the ARCHITECT shall be made by the CONTRACTOR with a dated transmittal form or letter and not by subcontractors or suppliers.
9. The ARCHITECT'S review of shop drawings shall not relieve the CONTRACTOR of responsibility for any deviation from the requirements of the Contract Documents unless the CONTRACTOR has informed the ARCHITECT in writing of such deviation at the time of submission and the ARCHITECT has given written acceptance to the specific deviation, nor shall the ARCHITECT'S favorable review relieve the CONTRACTOR from responsibility for errors or omissions in the shop drawings.
10. No portion of work requiring shop drawings shall be commenced until the shop drawings have been returned with a favorable review by the ARCHITECT.

D. Samples

1. Submit samples to illustrate functional and aesthetic characteristics of the Product with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
2. Submit samples of finishes from the full range of manufacturers' standard colors, textures and patterns for ARCHITECT selection or in custom colors selected.
3. Include identification on each sample with full Project information.
4. Submit a minimum of five (4) samples or as specified in individual sections of the specifications, four (3) of which will be retained by the ARCHITECT.
5. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

6. Selection or rejection of samples will be made by the ARCHITECT in writing.
- E. Quality Assurance/Control Submittals
1. Design Data, Test Reports, Certificates, Manufacturers' Instructions, Manufacturers' Field Reports, Qualification Statements
    - a. When specified in individual specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing in quantities specified for Product Data.
    - b. Identify conflicts between manufacturers' instructions and Contract Documents.
    - c. When specified in individual specification sections, submit manufacturers' certificate to ARCHITECT for review in quantities specified for Product Data.
    - d. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits and certifications as appropriate.
    - e. Certificates may be recent or previous test results on material or product but must be acceptable to ARCHITECT.
- F. Closeout Submittals
1. When specified in individual specification sections, submit eight (8) copies or (1) digital (.pdf).
  2. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information unique to this Project.
  3. After review, distribute and provide copies for Record Documents.
  4. Refer to section 01 70 00 for additional information.

END OF SECTION

PART 1 - GENERAL

1.01 APPLICABLE CODES AND STANDARDS

- A. This project is under the jurisdiction and is subject to the requirements of the following list of codes and standards:

- 2016 Building Standards Administrative Code Part 1, Title 24, C.C.R.
- 2016 California Building Code (CBC), Part 2, Title 24, C.C.R.  
(2015 International Building Code Volumes 1-2 and 2016 California Amendments)
- 2016 California Electrical Code (CEC) Part 3, Title 24, C.C.R.  
(2014 National Electrical Code and 2016 California Amendments)
- 2016 California Mechanical Code (CMC), Part 4,  
Title 24, C.C.R.  
(2015 Uniform Mechanical Code and  
2016 California Amendments)
- 2016 California Plumbing Code (CPC), Part 5,  
Title 24, C.C.R.  
(2015 Uniform Plumbing Code and  
2016 California Amendments)
- 2016 California Energy Code, Part 6, Title 24, C.C.R.
- 2013 ASME A17.1 Safety Code for Elevators and Escalators
- 2016 California Fire Code, Part 9, Title 24, C.C.R.  
(2016 International Fire Code and 2016 California Amendments)
- 2016 California Referenced Standards,  
Part 12, Title 24, C.C.R.

Title 19, C.C.R., Public Safety, State Fire Marshal Regulations

|          |                             |              |
|----------|-----------------------------|--------------|
| NFPA 13  | Automatic Sprinkler Systems | 2016 Edition |
| NFPA 14  | Standpipes Systems          | 2013 Edition |
| NFPA 17a | Wet Chemical Systems        | 2013 Edition |
| NFPA 20  | Stationary Pumps            | 2016 Edition |
| NFPA 24  | Private Fire Mains          | 2016 Edition |

|           |  |              |
|-----------|--|--------------|
| NFPA 72   | National Fire Alarm Codes (California Amended)<br>(Note See UL Standard 1971 For "Visual Devices") | 2016 Edition |
| NFPA 80   | Standard for Fire Rooms and Other Opening<br>Protectives   | 2016 Edition |
| NFPA 2001 | Clean Agent Fire Extinguishing Systems   | 2015 Edition |

Reference Code Section For NFPA Standards - 2016 CBC (SFM) Chapter 35

- B. A copy of CCR Title 24, 2016 Part 1-5 must be kept on site during construction.

END OF SECTION

section 01 41 14  
cbc minimum requirements

A. 2016 California Building Code Minimum Requirements

1. Portland cement concrete paving & concrete finishes:
  - a. Portland cement concrete paving shall have a medium salt (medium broom) finish on all surfaces sloped less than 6% and slip resistant (heavy broom finish) on all surfaces sloped greater than 6%. CBC Section 11B-403.2.
2. Pavement markings:
  - a. Accessible parking spaces shall be located as near as practical to a primary entrance and shall be marked according to CBC Section 11B-502.
  - b. Surface slopes of accessible parking spaces and access aisles shall be the minimum possible and shall not exceed 2% slope in any direction. CBC Section 11B-502.4.
  - c. Loading and unloading access aisle shall be marked by a border painted blue. Within the blue border, hatched lines a maximum of 36" on center shall be painted a color contrasting with the parking surface, preferably blue or white. CBC Section 11B-502.
  - d. When blue color is used, it shall conform to Color No. 15090 per Federal Standard 595B.
  - e. Painted lines and markings on pavement are recommended to be 3" wide minimum.
3. Athletic and recreational surfaces:
  - a. Ground surfaces, including the wood fiber surface system, shall be inspected and maintained regularly and frequently to ensure continued compliance with ASTM F 1951 for Determination of Accessibility of Surface Systems.
  - b. Ground surfaces shall comply with ASTM F 1292 for Impact Attenuation of Surface Systems.
4. Fences, gates, and hardware:
  - a. Gates in path of travel must comply with door requirements. (CBC Section 11B-206.5/ADASAD 404) Specify hardware that does not require pinching, grasping, or twisting motion to operate and provide solid kick plates with smooth, uninterrupted surface on both sides, 10" minimum high. Clear space below gate shall be 3" maximum above paving on both sides of the gate. The maximum effort to operate the gates shall not exceed 5 lbs (22.2 N).
5. Railings and handrails:
  - a. Handrails for stairs and ramps shall be 1 1/4" to 1 1/2" diameter (1 1/2" nominal) and mounted 1 1/2" clear from side walls. CBC Section 11B-405.8 and 11B-505.1.
  - b. All welded joints and surfaces shall be ground smooth, no sharp or abrasive corners, edges or surfaces. Wall Surfaces adjacent to handrail shall be smooth. CBC 11B-505.8.
6. Treads and nosings:
  - a. Provide 2" contrasting color (70% recommended) warning stripe of material at least as slip resistant as the other treads of the stairs, 1" max. from edge of nosing and top landing. At interior stairs, provide

cbc minimum requirements

warning stripe at top landing and bottom tread nosing only. At exterior stairs, provide warning stripe at top landing and all tread nosings. CBC Section 11B-504.4.1.

7. Casework:
  - a. Provide U-shaped wire pulls or equally accessible pull hardware at all accessible casework. CBC Section 11B-811.4.
8. Wood stairs and handrails
  - a. Wood handrails for stairs and ramps shall comply with grip and mounting requirements of CBC Figure 11B-36.
9. Automatic entrance doors:
  - a. Automatic entrance doors shall comply with CBC Section 11B-404.3.
10. Pass and observation windows:
  - a. Pass-through windows for ticket booths, cashiers, and food service shall conform to the reach and access requirements of CBC Sections 11B-403.5.1; 11B-227.3 and 11B-904.4 for accessible transaction areas. Accessible pass-through shelves shall not exceed 34" height above interior finished floor surface or exterior pavement.
11. Door hardware:
  - a. Mounting height of latching hardware shall be 30" to 44" A.F.F. per CBC Section 11B-404.2.7.
  - b. Pressure to operate doors shall not exceed: 5 lbs. (22.2 N) for exterior doors, and 5lbs. (22.2 N) for interior doors. When fire doors are required, the maximum effort to operate the doors shall not exceed 5lbs (22.2 N), except that, when approved by DSA, the maximum effort to operate the doors may be increased not to exceed 15lbs (66.72N). CBC Sections 1008.1.3 and 11B-404.2.9/ADAAG 4.13.11.
  - c. Door closers, when provided, shall have sweep period adjusted so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3" from the strike. CBC Section 11B-404.2.8.1.
  - d. All hardware shall meet the requirements of CBC Sections 11B-404.2.7, 11B-404.2.8.1 and 1008.1.9.
  - e. Thresholds shall comply with CBC Sections 1008.1.7 and 11B-404.2.5.
  - f. Floor stops shall not be located in the path of travel and 4" maximum from walls. DSA Policy 99-08.
  - g. "Night Latch" (NL) hardware shall not be used for any accessible doors or gates unless the conditions of DSA Interpretation 10-08 DSA/AC (External) revised 4/28/09 are met. Such conditions must be clearly demonstrated and indicated in the specifications:
    1. Such hardware has a 'dogging' feature.
    2. It is dogged during the time the facility is open.
    3. Such 'dogging' operation is performed only by employees as their job function (non-public use).
12. Exit devices:
  - a. Panic hardware shall comply with CBC. Section 1008.1.10, (consider that if the device is mounted lower than 36" AFF, the clear opening

- may be restricted to less than the 32" required clear opening). Panic bar shall be mounted above 36" to 44" above finished floor surface.
- b. The unlatching force shall not exceed 5 lbs (22.2N), applied in the direction of travel.
  - c. "Night Latch" (NL) hardware shall not be used for any accessible doors or gates unless the conditions of DSA Interpretation 10-08 DSA/AC (External) revised 4/28/09 are met. Such conditions must be clearly demonstrated and indicated in the specifications:
    - 1. Such hardware has a 'dogging' feature.
    - 2. It is dogged during the time the facility is open.
    - 3. Such 'dogging' operation is performed only by employees as their job function (non-public use).
13. Ceramic Tile Flooring:
  - a. Ceramic Tile Flooring demonstrating a coefficient of friction of at least 0.6 per ASRM C1028 will be accepted as meeting the intent of slip resistance. CBC 11B-302/ADA Standards 4.5.1.
14. Quarry Tile Flooring:
  - a. Quarry Tile Flooring demonstrating a coefficient of friction of at least 0.6 per ASTM C1028 will be accepted as meeting the intent of slip resistance. CBC 11B-302/ADA Standards 4.5.1.
15. Resilient Flooring:
  - a. Resilient Flooring demonstrating a coefficient of friction of at least 0.6 per ASTM D2047 will be accepted as meeting the intent of slip resistance. CBC 11B-302/ADA Standards 4.5.1.
16. Detectable/tactile warning surfaces:
  - a. Special warnings for disabled persons shall comply with CBC Sections 11B-247.5; 11B-705.1.2.5/ADA Standards.
  - b. Provide minimum 5-year warranty per DSA Bulletin 10/1/02, revised 9/2/04.
  - c. Color yellow for detectable warning surface shall conform to Color No. 33538 per Federal Standards No. 595B. CBC Sections 11B-247.5 and 11B-705.1.
17. Carpeting:
  - a. Provide glue-down or firm cushion installation that complies with CBC Section 11B-302.2.
  - b. Carpet shall have a level loop, textured loop, level-cut, or level-cut/uncut pile texture and maximum pile height of 1/2" per CBC Section 11B-302.2/ADA Standards 4.5.3.
  - c. Carpet edges shall comply with CBC Section 11B-303.
18. Toilet Compartments:
  - a. Toilet compartments for disabled persons shall have a flip-over style or sliding latch, with a loop or U-shaped handle immediately below the latch on both sides of the door and an automatic closing device. Door hardware shall be mounted at 30" to 44" above finished floor. CBC Section 11B-604.8.1.2.
  - b. Doors at front entry stalls shall have 32" minimum clear width when the door is open 90°. CBC Section 11B-604.8.1.2.
  - c. Doors at side entry stalls shall have 34" minimum clear width when the door is open 90°. CBC Section 11B-604.8.1.2.

19. Signage and graphics:
- a. Tactile character type: Tactile characters on signs shall be raised 1/32 inch (0.794 mm) minimum and shall be sans serif uppercase characters accompanied by Contracted Grade 2 Braille (see not below). CBC Section 11B-703.
  - b. Tactile character size: Raised characters shall be a minimum of 5/8 inch (15.9 mm) and a maximum of 2 inches (51 mm) high. CBC Section 11B-703.
  - c. Finish and contrast: Contrast between character, symbols and their background must be 70% minimum and have a non-glare finish. CBC Section 11B-703.
  - d. Proportions: Characters on signs shall have a width-to-height ratio of between 3:5 and 1:1 and a stroke width-to-height ratio of between 1:5 and 1:10. CBC Section 11B-703. All letters measured must be uppercase. After choosing a typestyle to test, begin by printing the letters I, X, and O at 1 inch high. Place the template's 1:1 square over the X or O, whichever is narrower. If the character is not wider than 1 inch, or narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the I is too broad, and the 1:10 rectangle to see if it is too narrow. If all the tests are passed, the typestyle is compliant with proportion requirement.
  - e. Braille: California (Contracted) Grade 2 Braille shall be used wherever Braille is required in other portions of these standards. Dots shall be 1/10 inch (2.54 mm) on center in each cell with 2/10 inch (5.08 mm) above the background. Braille dots shall be domed or rounded. CBC Section 11B-703
  - f. Mounting location shall be determined so that a person may approach within 3 inches (76 mm) of signage without encountering protruding objects or standing within the swing of the door. CBC Section 11B-703.
20. Lockers:
- a. Provide latch and locking hardware that does not require twisting, pinching or grasping to operate.
  - b. Provide shelf and pole at 48" max. AFF and lower shelf at 15" min. AFF. (Reach requirements per CBC 11B-308.2).
  - c. Provide 1% of total lockers or one minimum accessible locker per CBC Section 11B-225.2.1.
21. Toilet Accessories:
- a. Toilet accessories required to be accessible shall be mounted at heights according to CBC Section 11B-603.5 and DSA checklist Fig. 15-A.
  - b. The grab bar can not project more than 3" into the minimum clear space in front of the water closet. CBC Section 11B-604.5.
  - c. Toilet paper and feminine napkin dispensers located on the grab bar side of an accessible toilet room or stall should not project more than the grab bar. The accessory shall not be located closer than 1 1/2" clear of the tangent point of the grab bar. Accessories surface mounted above grab bar will restrict usability.



- 22. Playground equipment:
  - a. Playground equipment to have accessible points of entry and use.
  - b. Safety performance specification for playground equipment shall comply with the most current standard of ASTM F 1487. DSA-AC checklist 20.32 and 20.33 Item 1 (Revised 01/01/11).
- 23. Casework:
  - a. Provide U-shaped wire pulls at all accessible casework or equally accessible pull hardware that does not require tight grasping, pinching or twisting of the wrist. CBC Section 11B-811.4.
- 24. Fixed audience seating:
  - a. Fixed seating for areas of public assembly shall comply with all of the seating requirements of CBC Section 11B-221.
- 25. Fire Protection
  - a. Fire Extinguisher Cabinets must comply with CBC Sections 11B-205 and 11B-305.
- 26. Plumbing fixtures:
  - a. Accessible plumbing fixtures shall comply with all of the requirements of CBC Section 1115B.
  - b. Heights and location of all fixtures shall be according to CBC Section 1115B.4 and DSA checklist Fig. 15-A.
  - c. Fixture controls shall comply with CBC Section 1115B.4.4.4 for showers, 1115B.4.3.1 for lavatories, 1115B.4.1.5 for toilets and 1115B.4.2.2 for urinals.
  - d. Sinks shall not exceed 6-1/2" in depth, CBC Section 1115B.4.3.
- 27. Fire Alarm Systems:
  - a. Manual Pull Stations must comply with CBC Sections 1117B.6 and 1118B.
- 28. Sound reinforcing:
  - a. Provide Assistive Listening System per CBC Section 1104B.2. The minimum number of receivers shall be equal to 4% of the seating, but not less than two. Refer to Electrical drawings and specifications.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Definitions
2. Specifications Format and Content
3. Industry Standards
4. Code and Standards
5. Governing regulations/authorities

1.02 REFERENCES

The standards are referenced in these specifications by acronyms which are listed below with the full name of the sponsoring organization and the address from which copies may be obtained.

AA Aluminum Association  
900 19th Street NW, Suite 300  
Washington, DC 20006  
[www.aluminum.org](http://www.aluminum.org)

AABC Associated Air Balance Council  
1518 "K" Street, NW, Suite 503  
Washington, DC 20005  
[www.aabchq.com](http://www.aabchq.com)

AAMA American Architectural Manufacturers Association  
1827 Walden Office Square, Suite 104  
Schaumburg, IL 60173-4268  
[www.aamanet.org](http://www.aamanet.org)

AASHTO American Association of State Highway and Transportation Officials  
444 North Capitol Street, Suite 249  
Washington, DC 20001  
[www.aashto.org](http://www.aashto.org)

AATCC American Association of Textile Chemists and Colorists  
P.O. Box 12215  
One Davis Drive  
Research Triangle Park, NC 27709-2215  
[www.aatcc.org](http://www.aatcc.org)

ACI American Concrete Institute  
P.O. Box 9094  
Farmington Hills, MI 48333-9094  
[www.aci-int.org](http://www.aci-int.org)

ACPA American Concrete Pipe Association  
222 West Las Colinas Blvd., Suite 641  
Irving, TX 75039-5423  
[www.concrete-pipe.org](http://www.concrete-pipe.org)

ADC Air Diffusion Council  
104 South Michigan Avenue, Suite 1500  
Chicago, IL 60603

AF&PA American Forest and Paper Association  
1111 19th Street, NW, Suite 800  
Washington, DC 20036  
[www.afandpa.org](http://www.afandpa.org)

AGA American Gas Association  
400 North Capitol Street N.W.  
Washington, D.C. 20001  
[www.aga.com](http://www.aga.com)

AHA American Hardboard Association  
1210 West Northwest Hwy  
Palatine, IL 60067-1897  
[www.hardboard.org](http://www.hardboard.org)

AHAM Association of Home Appliance Manufacturers  
1111 19th Street NW, #402  
Washington, DC 20036  
[www.aham.org](http://www.aham.org)

AI Asphalt Institute  
Research Park Drive  
P.O. Box 14052  
Lexington, KY 40512-4052  
[www.asphaltinstitute.org](http://www.asphaltinstitute.org)

AIA The American Institute of Architects  
1735 New York Avenue, NW  
Washington, DC 20006-5292  
[www.e-architect.com](http://www.e-architect.com)

AISC American Institute of Steel Construction  
One East Wacker Drive, Suite 3100  
Chicago, IL 60601-2001  
[www.aisc.org](http://www.aisc.org)

AISI American Iron and Steel Institute  
P.O. Box 4321  
Chestertown, MD 21690  
[www.steel.org](http://www.steel.org)

AITC American Institute of Timber Construction  
7012 South Revere Parkway, Suite 140  
Englewood, CO 80112  
[www.aitc-glulam.org](http://www.aitc-glulam.org)

ALCA Associated Landscape Contractors of America  
12200 Sunrise Valley Drive, Suite 150  
Reston, VA 20191  
[www.alca.org](http://www.alca.org)

ALI Associated Laboratories, Inc.  
P.O. Box 152837  
1323 Wall Street  
Dallas, TX 75315

ALSC American Lumber Standards Committee  
P.O. Box 210  
Germantown, MD 20875

AMCA Air Movement and Control Association  
International, Inc.  
30 West University Drive  
Arlington Heights, IL 60004-1893  
[www.amca.org](http://www.amca.org)

ANLA American Nursery and Landscape Association  
1250 "I" Street, NW, Suite 500  
Washington, DC 20005-3922  
[www.anla.org](http://www.anla.org)

ANSI American National Standards Institute  
11 West 42nd Street, 13th Floor  
New York, NY 10036-8002  
[www.ansi.org](http://www.ansi.org)

APA APA-The Engineered Wood Association  
2130 Barret Park Drive, Suite 102  
Kennesaw, GA 30144-3681  
[www.apawood.org](http://www.apawood.org)

APA Architectural Precast Association  
6710 Winkler Road, Suite 8  
Fort Myers, FL 33919  
[www.archprecast.org](http://www.archprecast.org)

ARI Air Conditioning and Refrigeration Institute  
4301 Fairfax Drive, Suite 425  
Arlington, VA 22203  
[www.ari.org](http://www.ari.org)

ARMA Asphalt Roofing Manufacturers Association  
1156-15th Street, NW, Suite 900  
Washington, DC 20005  
[www.asphaltroofing.org](http://www.asphaltroofing.org)

ASA Acoustical Society of America  
500 Sunnyside Blvd.  
Woodbury, NY 11797  
[www.acoustics.org](http://www.acoustics.org)

ASCE American Society of Civil Engineers  
World Headquarters (703) 295-6300  
1801 Alexander Bell Drive  
Reston, VA 20190-4400  
[www.asce.org](http://www.asce.org)

ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers  
1791 Tullie Circle, NE  
Atlanta, GA 30329-2305  
[www.ashrae.org](http://www.ashrae.org)

ASLA American Society of Landscape Architects  
4401 Connecticut Avenue, NW, Fifth Floor  
Washington, DC 20008-2369  
[www.asla.org](http://www.asla.org)

ASME ASME International  
Three Park Avenue  
New York, NY 10016-5990  
[www.asme.org](http://www.asme.org)

ASPE American Society of Plumbing Engineers  
3617 Thousand Oaks Blvd., Suite 210  
Westlake, CA 91362-3649

ASQC American Society for Quality  
611 East Wisconsin Avenue  
Milwaukee, WI 53201-3005  
[www.asq.org](http://www.asq.org)

ASSE American Society of Sanitary Engineers  
28901 Clemens Road  
Westlake, OH 44145  
[www.asse-plumbing.org](http://www.asse-plumbing.org)

ASTM American Society for Testing and Materials  
100 Barr Harbor Drive  
West Conshohocken, PA 19428-2959  
[www.astm.org](http://www.astm.org)

AWCI Association of the Wall and Ceiling Industries - International  
307 East Annandale Road, Suite 200  
Falls Church, VA 22042-2433  
[www.awci.org](http://www.awci.org)

AWI Architectural Woodwork Institute  
1952 Isaac Newton Square  
Reston, VA 20190  
[www.awinet.org](http://www.awinet.org)

AWPA American Wood-Preservers' Association  
3246 Fall Creek Highway, Suite 1900  
Granbury, TX 76049-7979

AWS American Welding Society  
550 NW LeJeune Road  
Miami, FL 33126  
[www.amweld.org](http://www.amweld.org)

AWWA American Water Works Association  
6666 West Quincy Avenue  
Denver, CO 80235  
[www.awwa.org](http://www.awwa.org)

BHMA Builders' Hardware Manufacturers Association  
355 Lexington Avenue, 17th Floor  
New York, NY 10017-6603

BIA Brick Institute of America  
11490 Commerce Park Drive  
Reston, VA 22091-1525  
[www.bia.org](http://www.bia.org)

CE Corps of Engineers (U.S. Department of the Army)  
20 Massachusetts Avenue, NW  
Washington, DC 20314  
CRD standards are available from:

U.S. Army Corps of Engineers  
Waterways Experiment Station  
Technical Report Distribution Section  
Services Branch, TIC  
3909 Halls Ferry Road  
Vicksburg, MS 39180-6199

CBM Certified Ballast Manufacturers Association  
1422 Euclid Avenue, Suite 402  
Cleveland, OH 44115-2094

CCC Carpet Cushion Council  
P.O. Box 546  
Riverside, CT 06878-0546  
[www.carpetcushion.org](http://www.carpetcushion.org)

CDA Copper Development Association  
260 Madison Avenue, 16th Floor  
New York, NY 10016-2401  
[www.copper.org](http://www.copper.org)

CGA Compressed Gas Association  
1725 Jefferson Davis Highway, Suite 1004  
Arlington, VA 22202-4102  
[www.cganet.com](http://www.cganet.com)

CISCA Ceilings & Interior Systems Construction Association  
1500 Lincoln Highway, Suite 202  
St. Charles, IL 60174  
[www.cisca.org](http://www.cisca.org)

CISPI Cast Iron Soil Pipe Institute  
5959 Shallowford Road, Suite 419  
Chattanooga, TN 37421  
[www.cispi.org](http://www.cispi.org)

CLFMI Chain Link Fence Manufacturers Institute  
10015 Old Columbia Road, #B-215  
Columbia, MD 21046  
[www.chainlinkinfo.org](http://www.chainlinkinfo.org)

CPSC Consumer Product Safety Commission  
East West Towers  
4330 East-West Highway  
Bethesda, MD 20814

CPPA Corrugated Polyethylene Pipe Association  
432 North Superior Street  
Toledo, OH 43604

CRA California Redwood Association  
405 Enfrente Drive, Suite 200  
Novato, CA 94949  
[www.calredwood.org](http://www.calredwood.org)

CRI Carpet and Rug Institute  
310 South Holiday Avenue  
Dalton, GA 30722-2048  
[www.carpet-rug.com](http://www.carpet-rug.com)

CRSI Concrete Reinforcing Steel Institute  
933 North Plum Grove Road  
Schaumburg, IL 60173-4758  
[www.crsi.org](http://www.crsi.org)

CSSB Cedar Shake and Shingle Bureau  
515 116th Avenue, NE, Suite 275  
Bellevue, WA 98004-5294  
[www.cedarbureau.org](http://www.cedarbureau.org)

CTI Ceramic Tile Institute of America  
12061 West Jefferson Blvd.  
Culver City, CA 90230-6219  
[www.ceramic-tile.com](http://www.ceramic-tile.com)

DHI Door and Hardware Institute  
14170 Newbrook Drive  
Chantilly, VA 20151-2223  
[www.dhi.org](http://www.dhi.org)

DIPRA Ductile Iron Pipe Research Association  
245 Riverchase Parkway East, Suite O  
Birmingham, AL 35244  
[www.dipra.org](http://www.dipra.org)

DOC Department of Commerce  
5285 Port Royal Road  
Springfield, VA 22161

DOT Department of Transportation  
400 Seventh Street, SW  
Washington, DC 20590

EIMA EIFS Industry Members Association  
402 North Fourth Street, Suite 102  
Yakima, WA 98901-2470  
[www.eifsfacts.com](http://www.eifsfacts.com)

EJMA Expansion Joint Manufacturers Association  
25 North Broadway  
Tarrytown, NY 10591-3201  
[www.ejma.org](http://www.ejma.org)

EPA Environmental Protection Agency  
401 "M" Street, SW  
Washington, DC 20460  
[www.epa.gov](http://www.epa.gov)

FCICA Floor Covering Installation Contractors Association  
7439 Millwood Drive  
West Bloomfield, MI 48322-1234  
[www.fcica.com](http://www.fcica.com)



FM Factory Mutual  
1151 Boston-Providence Turnpike  
P.O. Box 9102  
Norwood, MA 02062-9102  
[www.fmglobal.com](http://www.fmglobal.com)

FCCHR Foundation for Cross-Connection Control and Hydraulic Research  
University of Southern California  
KAP-200 University Park MC-2531  
Los Angeles, CA 90089-25319

FS Federal Standards  
(Available from GSA)  
470 East L'Enfant Plaza, SW, Suite 8100  
Washington, DC 20407

FTI Facing Tile Institute  
% Stark Ceramics  
P.O. Box 8880  
Canton, OH 44711

GA Gypsum Association  
810 First Street NE, Suite 510  
Washington, DC 20002  
[www.gypsum.org](http://www.gypsum.org)

GANAGlass Association of North America  
3310 SW Harrison Street  
Topeka, KS 66611-2279  
[www.glasswebsite.com/gana](http://www.glasswebsite.com/gana)

HMA Hardwood Manufacturers Association  
400 Penn Center Blvd., Suite 530  
Pittsburgh, PA 15235-5605  
[www.hardwood.org](http://www.hardwood.org)

HPVA Hardwood Plywood and Veneer Association  
1825 Michael Farraday Drive  
P.O. Box 2789  
Reston, VA 20195  
[www.hpva.org](http://www.hpva.org)

IEEE Institute of Electrical and Electronic Engineers  
445 Hoes Lane (212) 705-7900  
Piscataway, NJ 08855-1331  
[www.standards.ieee.org](http://www.standards.ieee.org)

IESNA Illuminating Engineering Society of North America  
120 Wall Street, 17th Floor  
New York, NY 10005-4001  
[www.iesna.org](http://www.iesna.org)

ILI Indiana Limestone Institute of America  
Stone City Bank Building, Suite 400  
Bedford, IN 47421  
[www.ili.ai](http://www.ili.ai)

ITS Intertek Testing Services  
P.O. Box 2040  
3933 US Route 11  
Cortland, NY 13045-7902  
[www.itsglobal.com](http://www.itsglobal.com)

KCMA Kitchen Cabinet Manufacturers Association  
1899 Preston White Drive  
Reston, VA 22091-4326  
[www.kcma.org](http://www.kcma.org)

LMA Laminating Materials Association  
116 Lawrence Street  
Hillsdale, NJ 07642-2730  
[www.lma.org](http://www.lma.org)

MBMA Metal Building Manufacturer's Association  
1300 Sumner Avenue  
Cleveland, OH 44115-2851  
[www.mbma.org](http://www.mbma.org)

MCAA Mechanical Contractors Association of America  
1385 Piccard Drive  
Rockville, MD 20850-4329  
[www.mcaa.org](http://www.mcaa.org)

MFMA Maple Flooring Manufacturers Association  
60 Revere Drive, Suite 500  
Northbrook, IL 60062  
[www.maplefloor.org](http://www.maplefloor.org)

MIA Marble Institute of America  
33505 State Street  
Farmington, MI 48335  
[www.marble-institute.com](http://www.marble-institute.com)

MIA Masonry Institute of America  
2550 Beverly Blvd.  
Los Angeles, CA 90057  
[www.masonryinstitute.org](http://www.masonryinstitute.org)

ML/SFAMetal Lath/Steel Framing Association  
(A Division of the NAAMM)  
8 South Michigan Avenue, Suite 1000  
Chicago, IL 60603

MSS Manufacturers Standardization Society for the Valve and Fittings Industry  
127 Park Street, NE  
Vienna, VA 22180-4602  
[www.mss-hq.com](http://www.mss-hq.com)

NAA National Arborist Association  
P.O. Box 1094 (603) 673-3311  
Amherst, NH 03031-1094  
[www.natlarb.com](http://www.natlarb.com)

NAAMM National Association of Architectural  
Metal Manufacturers  
8 South Michigan Avenue, Suite 1000  
Chicago, IL 60603  
[www.naamm.org](http://www.naamm.org)

NAIMA North American Insulation Manufacturers Association  
44 Canal Center Plaza, Suite 310  
Alexandria, VA 22314  
[www.naima.org](http://www.naima.org)

NAPA National Asphalt Pavement Association  
NAPA Building  
5100 Forbes Blvd.  
Lanham, MD 20706-4413

NBGQA National Building Granite Quarries Association  
1220 "L" Street, NW #100-167  
Washington, DC 20005  
[www.nbgqa.com](http://www.nbgqa.com)

NCMA National Concrete Masonry Association  
2302 Horse Pen Road  
Herndon, VA 20171-3499  
[www.ncma.org](http://www.ncma.org)

NCPI National Clay Pipe Institute  
P.O. Box 759  
253-80 Center Street  
Lake Geneva, WI 53147  
[www.ncpi.org](http://www.ncpi.org)

NCRPM National Council on Radiation Protection  
and Measurements  
7910 Woodmont Ave., Suite 800  
Bethesda, MD 20814-3095  
[www.ncrp.com](http://www.ncrp.com)

NCSPA National Corrugated Steel Pipe Association  
1255 23rd Street, NW, Suite 850  
Washington, DC 20037  
[www.ncspa.org](http://www.ncspa.org)

NEBB National Environmental Balancing Bureau  
8575 Grovemont Circle  
Gaithersburg, MD 20877-4121  
[www.nebb.org](http://www.nebb.org)

NECA National Electrical Contractors Association  
3 Bethesda Metro Center, Suite 1100  
Bethesda, MD 20814-5372  
[www.necanet.org](http://www.necanet.org)

NEI National Elevator Industry  
185 Bridge Plaza North, Suite 310  
Fort Lee, NJ 07024

NEMA National Electrical Manufacturers' Association  
1300 North 17th Street, Suite 1847  
Rosslyn, VA 22209  
[www.nema.org](http://www.nema.org)

NFPA National Fire Protection Association  
One Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9101  
[www.nfpa.org](http://www.nfpa.org)

NHLA National Hardwood Lumber Association  
P.O. Box 34518  
Memphis, TN 38184-0518  
[www.natlhardwood.org](http://www.natlhardwood.org)

NIA National Insulation Association  
99 Canal Center Plaza, Suite 222  
Alexandria, VA 22314  
[www.insulation.org](http://www.insulation.org)

NOFMA National Oak Flooring Manufacturers Association  
P.O. Box 3009  
Memphis, TN 38173-0009  
[www.nofma.org](http://www.nofma.org)

NPA National Particleboard Association  
18928 Premiere Court  
Gaithersburg, MD 20879-1569  
[www.pbmdf.com](http://www.pbmdf.com)

NPCA National Paint and Coatings Association  
1500 Rhode Island Avenue, NW  
Washington, DC 20005-5597  
[www.paint.org](http://www.paint.org)

NRCA National Roofing Contractors Association  
P.O. Box 809261  
Chicago, IL 60680-9261  
[www.roofonline.org](http://www.roofonline.org)

NRMCA National Ready Mixed Concrete Association  
900 Spring Street  
Silver Spring, MD 20910  
[www.nrmca.org](http://www.nrmca.org)

NSA National Stone, Sand and Gravel Association  
2101 Wilson Blvd.  
Arlington, VA 22201  
[www.nssga.org](http://www.nssga.org)

NSF NSF International  
P.O. Box 130140  
Ann Arbor, MI 48113-0140  
[www.nsf.org](http://www.nsf.org)

NSSEA National School Supply and Equipment Association  
8300 Colesville Road, Suite 250  
Silver Spring, MD 20910  
[www.nssea.org](http://www.nssea.org)

NTMA National Terrazzo and Mosaic Association  
3166 Des Plaines Avenue, Suite 121  
Des Plaines, IL 60018  
[www.ntma.com](http://www.ntma.com)

NUSIG National Uniform Seismic Installation Guidelines  
12 Lahoma Court  
Alamo, CA 94526

NWWDA The Window and Door Manufacturer's Door Association  
1400 East Touhy Avenue, Suite 470  
Des Plaines, IL 60018  
[www.wdma.org](http://www.wdma.org)

OSHA Occupational Safety and Health Administration  
(U.S. Department of Labor)  
200 Constitution Avenue, NW  
Washington, DC 20210

PCA Portland Cement Association  
5420 Old Orchard Road  
Skokie, IL 60077-1083  
[www.portcement.org](http://www.portcement.org)

PCI Precast/Prestressed Concrete Institute  
175 W. Jackson Blvd.  
Chicago, IL 60604  
[www.pci.org](http://www.pci.org)

PDCA Painting and Decorating Contractors of America  
3913 Old Lee Highway, Suite 33-B  
Fairfax, VA 22030  
[www.pdca.com](http://www.pdca.com)

PDI Plumbing and Drainage Institute  
45 Bristol Drive (508) 230-3516  
South Easton, MA 02375  
[www.pdionline.org](http://www.pdionline.org)

PEI Porcelain Enamel Institute  
4004 Hillsboro Pike, Suite 224-B  
Nashville, TN 37215  
[www.porcelainenamel.com](http://www.porcelainenamel.com)

RFCI Resilient Floor Covering Institute  
401 East Jefferson #102  
Rockville, MD 20850  
[www.rfci.com](http://www.rfci.com)

RIS Redwood Inspection Service  
c/o California Redwood Association  
405 Enfrente Drive, Suite 200  
Novato, CA 94949-7206  
[www.calredwood.org](http://www.calredwood.org)

SDI Steel Deck Institute  
P.O. Box 25  
Fox River Grove, IL 60012  
[www.sdi.org](http://www.sdi.org)

SDI Steel Door Institute  
30200 Detroit Road  
Cleveland, OH 44145-1967  
[www.steeldoor.org](http://www.steeldoor.org)

SIGMA Sealed Insulating Glass Manufacturers Association  
401 N. Michigan Avenue  
Chicago, IL 60611-4267

SJI Steel Joist Institute  
3127 Tenth Avenue, North Ext.  
Myrtle Beach, SC 29577-6760  
[www.steeljoist.org](http://www.steeljoist.org)

SMA Stucco Manufacturers Association  
14006 Ventura Blvd.  
Sherman Oaks, CA 91403

SMACNA Sheet Metal and Air Conditioning Contractors  
National Association, Inc.  
4201 Lafayette Center Drive  
Chantilly, VA 20151-1209  
[www.smacna.org](http://www.smacna.org)

SPI Society of the Plastics Industry, Inc.  
Spray Polyurethane Division  
1801 "K" Street, NW, Suite 600K  
Washington, DC 20006  
[www.socplas.org](http://www.socplas.org)

SPIB Southern Pine Inspection Bureau  
4709 Scenic Highway  
Pensacola, FL 32504-9094  
[www.spib.org](http://www.spib.org)

SPRI (Formerly: Single Ply Roofing Institute)  
200 Reservoir Street, Suite 309A  
Needham, MA 02494  
[www.spri.org](http://www.spri.org)

SSPC The Society for Protective Coatings  
40 24th Street, Sixth Floor  
Pittsburgh, PA 15222-4656  
[www.sspc.org](http://www.sspc.org)

SWI Steel Window Institute  
c/o Thomas Associates, Inc.  
1300 Sumner Avenue  
Cleveland, OH 44115-2851  
[www.steelwindows.com](http://www.steelwindows.com)

TCA Tile Council of America  
100 Clemson Research Blvd.  
Anderson, SC 29625  
[www.tileusa.com](http://www.tileusa.com)

TPI Truss Plate Institute  
583 D'Onofrio Drive, Suite 200  
Madison, WI 53719

TPI Turfgrass Producers International  
1855-A Hicks Road  
Rolling Meadows, IL 60008  
[www.turfgrasssod.org](http://www.turfgrasssod.org)

UL Underwriters Laboratories, Inc.  
333 Pfingston Road  
Northbrook, IL 60062  
[www.ul.com](http://www.ul.com)

UNI Uni-Bell PVC Pipe Association  
2655 Villa Creek Drive, Suite 155  
Dallas, TX 75234  
[www.uni-bell.org](http://www.uni-bell.org)

USDA U.S. Department of Agriculture  
14th Street and Independence Avenue, SW  
Washington, DC 20250

USPS U.S. Postal Service  
475 L'Enfant Plaza, SW  
Washington, DC 20260-0010

WA Wallcoverings Association  
401 North Michigan Avenue  
Chicago, IL 60611-4267  
[www.wallcoverings.org](http://www.wallcoverings.org)

WCLIB West Coast Lumber Inspection Bureau  
P.O. Box 23145  
Portland, OR 97281-3145  
[www.wclib.org](http://www.wclib.org)

WCMA Window Covering Manufacturers Association  
355 Lexington Avenue, 17th Floor  
New York, NY 10017-6603

WIC Woodwork Institute of California  
P.O. Box 980247  
West Sacramento, CA 95798-0247  
[www.wicnet.org](http://www.wicnet.org)

WLPDIA Western Lath/Plaster/Drywall Industries Association  
8635 Navajo Road  
San Diego, CA 92119

WMMPA Wood Moulding & Millwork Producers Association  
507 First Street  
Woodland, CA 95695  
[www.wmmpa.com](http://www.wmmpa.com)

WRI Wire Reinforcement Institute  
P.O. Box 450  
Findlay, OH 45839-0450  
[www.wirereinforcementinstitute.org](http://www.wirereinforcementinstitute.org)

WWPA Western Wood Products Association - Yeon Building  
522 S.W. Fifth Avenue, #500  
Portland, OR 97204-2122  
[www.wwpa.org](http://www.wwpa.org)



### 1.03 DEFINITIONS

- A. Regulations: Includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the work.

### 1.04 SYSTEM DESCRIPTIONS

#### A. Specification Format and Content

1. Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 2004 Masterformat numbering system.
2. The sections are placed in the Project Manual in numeric sequence; however, this sequence is not complete, and the Table of Contents of the specifications must be consulted to determine the total listing of sections.
3. The section title is not intended to limit the meaning or content of the section, nor is it to be fully descriptive of the requirements specified therein.
4. The organization of the specifications shall not control the division of the work among subcontractors or establish the extent of work to be performed by any trade.
5. Specifications use certain conventions regarding style of language and the intended meaning of certain terms, words and phrases when used in particular situations or circumstances. These conventions are:
  1. Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable to maintain the context of the Contract Document indicated.
  2. Imperative and streamlined language is generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the CONTRACTOR. Subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the CONTRACTOR, or by others when so noted.
  3. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

B. Industry Standards

1. Except where Contract Documents include more stringent requirements, applicable construction industry standards shall apply as if bound into the Contract Documents to the extent referenced. Such standards are made part of Contract Documents by reference.
2. Conform to reference standard by date of issue current on date for receiving bids except when a specific date is indicated.
3. Where compliance with two (2) or more standards is specified and where standards may establish different or conflicting requirements for quantities or quality levels, the more stringent, higher quality and greater quantity of work shall apply.
4. The quantity or quality level shown or specified shall be the minimum provided or performed. Indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements.
5. Each entity engaged in construction of the work is required to be familiar with industry standards applicable to its construction activity.
6. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required activity, CONTRACTOR shall obtain copies directly from publication source.
7. Trade association's names and titles of general standards are frequently abbreviated. Where such abbreviations are used in the Specifications or other Contract Documents, they shall mean the recognized trade association, standards-generating organization, authority having jurisdiction or other entity applicable to the content of the text provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries. A partial list is included at the end of this section.
8. Refer to individual specification sections and related drawings for names and abbreviations of trade associations and standards applicable to specific portions of the work.
9. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Quality assurance and control of installation.
2. Certifications
3. Field samples.
4. Mock-up.
5. Manufacturers' field services and reports.

1.02 QUALITY ASSURANCE

A. Qualifications

1. Monitor quality control over suppliers, manufacturers, products, services, site conditions and workmanship to produce work of specified quality.
2. Comply fully with manufacturers' instructions including each step-in sequence.
3. Should manufacturers' instructions conflict with Contract Documents, request clarification from ARCHITECT before proceeding.
4. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.
5. Perform work by persons qualified to produce workmanship of specified quality.
6. Where experience minimums for workmen, applicators, companies or manufacturers are required in individual sections, written certification and documentation substantiating such minimums shall be submitted and approved by the ARCHITECT, when requested.
7. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

B. Regulatory Requirements

1. All work pertaining to and all materials supplied for executing and completing this Contract shall comply with provisions specified in the Contract Documents and with all applicable laws, regulations and ordinances governing Work.

C. Certifications

1. Manufacturers' Field Services and Reports
  - a. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable and to initiate instructions when necessary.
  - b. Manufacturers' Representatives shall report observations and site decisions, or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
  - c. Submit report of observation to ARCHITECT for review.

D. Field Samples

1. Install field samples at the site as required by individual specifications sections for review by ARCHITECT.
2. Accepted samples represent a quality level for the Work.
3. Where field sample is specified in individual sections to be removed, clear area after field sample has been accepted by ARCHITECT and is no longer required for reference.

E. Mock-ups

1. Tests will be performed under provisions identified in this section.
2. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals and finishes.
3. Where mock-up is specified in individual sections to be removed, clear area after mock-up has been accepted by ARCHITECT and is no longer required for reference.

F. Pre-installation Meetings

1. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to attend meetings regarding installation of specified Work.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. The Owner will select and retain the services of a testing agency approved by D.S.A. with assigned inspector and others responsible for testing and inspection of the work, coordinating the work and materials as specified to be furnished by the Contractor - all indicated in this section and/or elsewhere in the contract documents.
  - 1. All assigned inspectors must submit a DSA Form SSS-5, Inspector Qualification Form for DSA approval.
  - 2. At completion of the project, a Form DSA-6 Verified Report shall be submitted by the Project Inspector, and a Form DSA-6A/E shall be submitted by the Design Professional and Project Engineers per Title 24, Part 1, Section 4-336.
- B. Related Requirements.
  - 1. The general provisions of the contract documents.
  - 2. Testing requirement may be described in other section of this specification.
  - 3. Where no testing requirements are specified or required by reference standards or authorities having jurisdiction, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described herein.

1.02 QUALITY ASSURANCE

- A. The Owner's selected independent laboratory/ies will conduct testing services in accordance with ASTM E329.
- B. Selection of materials required to be tested shall be by the Architect/Engineer's representing the Owner and not by the Contractor.

1.03 CODES AND STANDARDS

- A. Testing, when required, will be in accordance with pertinent requirements of the California Building Code, California Code of Regulations, Title 24 as part of the contract documents. Also, selected standards of the American Society for Testing and Materials or other organizations and agencies having published recognized codes, standards, or tests.

1.04 TESTS, INSPECTIONS

- A. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of materials to be supplied by him under the

Contract Documents, which must by terms of the Contract be tested, in order that the Owner may arrange for the testing of same at the source of supply. Sufficient time in advance will be defined as a minimum of twenty-four (24) hour Inspection Request for work to be inspected by the Project Inspector, and a minimum of forty-eight (48) hour Request for work to be inspected by the Testing Laboratory or other agencies.

- B. 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 representative that such testing and inspection will not be required shall not be incorporated in the job.
- C. The Owner will select and pay testing laboratory costs approved by D.S.A. for all tests and inspections, but may be reimbursed by the Contractor for such costs under the Contract conditions.

#### 1.05 TEST REPORTS

- A. Promptly process and distribute required copies of test reports and related instructions to ensure necessary retesting and/or replacement of materials with the least possible delay in progress of the work.
- B. One copy of all test reports shall be forwarded to the Division of the State Architect by the testing agency. Such reports shall include all tests made, regardless of whether such tests 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 sampled and tested in accordance with the requirements of 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.
- C. Each testing agency shall submit to the Division of the State Architect a verified report in duplicate covering all of the tests which are required to be made by that agency during the progress of the project. Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time, and at the completion of the project, covering all tests.

#### 1.06 PAYMENT FOR TESTING SERVICES

- A. Initial Services.
  - 1. The Owner will pay for initial testing and inspection except as specifically modified herein after or specified otherwise in technical sections, provided the results of inspection indicate compliance with the Contract Documents.
  - 2. When tests indicate noncompliance with the Contract Documents, the costs of tests or inspection associated with that noncompliance or failure will be deducted by the Owner from the Contract Sum.

- B. Retesting: When initial tests or inspection indicate noncompliance with the Contract Documents, subsequent retesting or reinspection occasioned but the noncompliance shall be performed by the same testing laboratory or Inspector and the costs thereof will be deducted by the Owner from the Contract Sum until test or inspection results indicate compliance.
- C. Code Compliance Testing: Inspections and tests required by codes or ordinances, or by authorities having jurisdiction and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Owner, but backcharged to the Contractor.
- D. Specified Inspections and Tests: Tests and inspections specified in the specifications, directly or by reference, shall be coordinated by the Contractor at his expense and paid for by the Owner. Corrections of noncompliance and test failures and reinspection and retesting shall be performed by the Contractor at his expense.
- E. Contractor's Convenience Testing: Inspecting or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of and at the expense of the Contractor.

#### 1.07 INSPECTION BY THE OWNER

- A. The Owner and his representative shall at all times have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection, including but not limited to scaffolding, ladders, lighting, etc.
- B. The Owner shall have the right to reject materials and workmanship which are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the Owner. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the Owner may correct same and charge the expense to the Contractor.
- C. Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

#### 1.08 OWNER'S INSPECTOR (PROJECT INSPECTOR)

- A. A Class I Inspector employed by the Owner, approved by D.S.A., in accordance with the requirements of State of California Code or Regulations, 4-333, 4-337, 4-342 of Title 24, Part 1, assigned to the work as duties are specifically defined.



- B. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.

#### 1.09 TESTING FACILITY

- A. All tests shall be performed by a testing facility acceptable to the architect and DSA. The testing facility shall be directly employed by the school district and no other entity or individual. Also see Title 24, Part 1, Section 4-335(b).
- B. Test reports shall be addressed to, and sent to, the school district by the testing facility. The testing facility shall send copies of all test reports, within 14 days of the test, to DSA, the school district, the architect, the structural engineer, and the project inspector by the testing facility.

#### PART 2 - PRODUCTS

(NOT APPLICABLE)

#### PART 3 - EXECUTION

##### 3.01 COOPERATION WITH TESTING LABORATORY AND INSPECTORS (SPECIAL INSPECTORS)

- A. Inspectors and representatives of the testing laboratory shall have access to the work at all times. Provide facilities for such access in order that the testing, inspection, and the obtaining of samples may be done properly.
- B. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by him under the contract documents, which must by terms of the contract be tested, in order that the Owner may arrange for the testing of same at the source of supply.
- C. 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 representative that such testing and inspection will not be required shall not be incorporated in the job.

##### 3.02 TAKING SPECIMENS

- A. Specimens and samples for testing, unless otherwise provided in these contract documents, shall be taken by the testing laboratory or Inspector. Sampling equipment and personnel will be provided by the testing laboratory. Deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

### 3.03 SCHEDULES FOR TESTING

#### A. Establishing Schedule:

1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.
2. Provide required time within the construction schedule.

#### B. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate such changes of schedule with the testing laboratory as required.

#### C. Adherence to Schedule: When the testing laboratory is ready to test according to the determined schedules, but is prevented from testing or taking specimens due to incompleteness of the work, extra charges for testing attributable to the delay may be back-charged to the Contractor and will be deducted by the Owner from the contract sum.

### 3.04 REQUIRED TESTING: Tests and inspections for the following will be required and shall conform to Title 24, Part 2, C.C.R 2016, Edition C.B.C.

#### A. Foundations (Chapter 18A)

Inspection of Foundations / Compaction (All inspectors must provide a DSA Form SSS-5 Inspector Qualification Form for DSA approval per code requirements):

1. Earth Fill Compaction Sec. 31 20 00.

#### B. Concrete (Chapters 17A & 19A)

Inspection of Concrete (All inspectors must provide a DSA Form SSS-5 Inspector Qualification Form for DSA approval per code requirements):

##### 1. Materials:

- a. Portland Cement Test Sec. 1916A.1.
- b. Concrete Aggregates Sec. 1903A.3.
- c. Reinforcing Bars Sec. 1903A.4, Sec. 1916A.2
- d. Batch Plant Inspection Sec. 1704A.4.3, Sec. 1704A.4.4.

##### 2. Concrete Quality:

- a. Proportions of Concrete, Sec. 1905A.1, 2, 3 and 4.
- b. Strength Tests of Concrete, Sec. 1905A.6.
- c. Splitting Tensile Tests ASTM C496 / C496M
- d. Cementitious Materials Sec. 1903A.

##### 3. Concrete Inspection:

- a. Job Site Inspection, Sec. 1905A.7.
- b. Batch Plant or Weighmaster Inspection, Sec. 1704A.4.3.
- c. Reinforcing Bar Welding Inspection, Sec. 1916A.2.

C. Masonry (Chapter 21A)

Inspection of Masonry (All masonry inspectors must provide a DSA Form SSS-5 Inspector Qualification Form for DSA approval per code requirements):

1. Materials:
  - a. Masonry Units, Table 1704A.5.1.
  - b. Portland Cement, ASTM C150.
  - c. Mortar and Grout Aggregates ASTM C780-06.
  - d. Reinforcing Bars, Table 1704A.5.1.
2. Masonry Quality:
  - a. Portland Cement Tests, Sec. 1903A.
  - b. Mortar and Grout Tests, Sec. 1708A.1.4.
  - c. Masonry Core Tests, Sec. 2105A.4.
  - d. Reinforcing Bar Tests, Sec. 1916A.2.
3. Masonry Inspection:
  - a. Reinforced Masonry, Table 1704A.5.1.
  - b. Reinforcing Bar Welding Inspection, Sec. 1704A.4.2.

D. Structural Steel (Chapter 22A)

Inspection of Structural Steel (All welding inspectors must provide a DSA Form SSS-5 Inspector Qualification Form for DSA approval per code requirements):

1. Materials:
  - a. Structural Steel, Cold Formed Steel, Sec.2202A.1.
  - b. Material Identification, Sec.2203A.
2. Inspection of Structural Steel (All welding inspectors must provide a DSA Form SSS-5 Inspector Qualification Form for DSA approval per code requirements):
  - a. Tests of Structural and Cold Formed Steel, Sec. 2212A.1.
  - b. Tests of H.S. Bolts, Nuts, Washers, Sec. 2212A.2.
  - c. Tests of End Welded Studs, AISC 360.
  - d. Welding Inspection, Sec. 1704A.3.1.
  - e. Erection of Structural Steel Inspection

E. Wood (Chapter 23)

Inspection of Wood (All inspectors must provide a DSA Form SSS-5 Inspector Qualification Form for DSA approval per code requirements):

1. Materials:
  - a. Lumber and Plywood Grading - Sec. 2303.1, Western Lumber Grade Rules EFF 9-1-91.
  - b. Glued-Laminated Members, Sec. 2303.1.3
2. Wood Inspection:
  - a. Glued-Laminated Fabrication, Sec. 1704A.6.2.1 (and the exceptions).
  - b. Timber Connections, Sec. 1715.1.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Furnishing and Installing:
  - a. Temporary Water
  - b. Temporary Sanitary Facilities
  - c. Fences and Barricades
  - d. Construction Equipment
  - e. Storage
  - f. Temporary Job Office
  - g. Temporary Electrical
  - h. Temporary Lighting
  - i. Temporary Heat
  - j. Temporary Ventilation
  - k. Barriers
  - l. Noise Control
  - m. Pollution Control
  - n. Exterior Enclosures
  - o. Access Roads
  - p. Progress Cleaning
  - q. Fire Protection

1.02 PROJECT CONDITIONS

A. Regulatory Requirements

1. Comply with governing regulations and utility company regulations and recommendations.
2. Comply with pollution and environmental protection regulations for use of water and energy, for discharge of wastes and storm drainage from Project Site and for control of dust, air pollution and noise.
3. Temporary construction shall conform to requirements of State, County and Local authorities and underwriters which pertain to operation, health, safety and fire hazard. CONTRACTOR shall furnish and install items necessary for conformance with such requirements, whether or not called for under the separate divisions of these specifications.

B. Temporary Water

1. The OWNER shall provide construction water at the closest existing fire hydrant as approved by the local jurisdiction. OWNER supplied point of connection shall include applicable temporary meter and backflow devices. CONTRACTORS requiring construction water shall provide all labor and materials (including cut and patch) to distribute.

C. Temporary Sanitary Facilities

1. CONTRACTOR will provide and maintain required temporary chemical type toilet facilities and enclosures.
2. Existing facilities shall not be used.

D. Fences and Barricades

1. After completion of site grading and before start of Work on the project site, CONTRACTOR may install a six (6) foot high temporary chain link fence with locked entrance gates to substantially enclose the entire project site. Any activities schedule to commence prior to the installation of fencing will be temporarily fenced by CONTRACTOR requiring same.
2. The CONTRACTOR requiring same shall construct and maintain planking, barricades, lights and warning signs as indicated as required by Local authorities and State safety ordinances and as necessary for the protection of the public.

E. Construction Equipment

1. CONTRACTOR shall erect, equip and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances and regulations of authority having jurisdiction.
2. CONTRACTOR shall provide, maintain and move upon completion of the Work all temporary rigging, scaffolding, hoisting equipment, rubbish chutes, ramps, stairs, runways, platforms, ladders, railings and other temporary construction as required for all work hereunder.

F. Storage

1. Operations of the CONTRACTOR, including storage of materials, shall be confined to areas approved by OWNER. CONTRACTOR shall be liable for damage caused by him/her during such use of property of the OWNER or other parties. CONTRACTOR shall save the OWNER along with their respective officers, employees and agents, and the ARCHITECT and his employees, free and harmless from liability of any nature or kind arising from any use, trespass or damage occasioned by his operations on premises of third persons.

Storage facilities shall provide protection of products from excessive cold, heat, moisture, humidity or physical abuse as specified in the respective sections for the products stored. Each CONTRACTOR requiring same shall provide their own temporary storage and security for same.

2. Staging areas will be under the supervision of the CONTRACTOR. Materials shall be placed and relocated as necessary for the progress of the project.

G. Temporary Job Office

1. Should any CONTRACTOR require office space, the CONTRACTOR requiring office space shall provide.

H. Temporary Electrical

1. If requested by CONTRACTOR, OWNER shall provide temporary power as follows:
  - a. One (1) 200-amp single phase service.
  - b. A 50-amp sub-panel mounted on a post will not be more than 50 feet away from each building pad.
  - c. Each sub-panel shall be equipped with two (2) 110-volt receptacles, one (1) 220-volt receptacle and one (1) 50 amp twist-lock pigtail.
2. Any temporary power requirements beyond these provided will be the responsibility of the CONTRACTOR requiring same.
3. All welding will be done with self-contained gas-powered units.

I. Temporary Lighting

1. Each CONTRACTOR shall be responsible to provide and maintain all temporary lighting as required to safely access and perform their work.

J. Temporary Heat

1. Temporary heat will be supplied and maintained by the CONTRACTOR requiring same.
2. Do not use permanent equipment for temporary heating purposes unless specifically noted otherwise in the contract documents.

K. Temporary Ventilation

1. All CONTRACTORS shall ventilate enclosed areas to assist cure of materials, dissipate humidity and to prevent accumulation of dust, fumes, vapors or gases as the above may be generated by them.

L. Barriers

1. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
2. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
3. Provided protection for plant life and trees designated to remain and for soft and hardscape areas adjacent to work, replace damaged materials as directed by the ARCHITECT.
4. Protect non-owned vehicular traffic, stored materials, site and structures from damage.
5. Construction workers shall not interact or communicate with students or staff except in emergency or safety related situations. (Post a sign to this effect at entry.)

M. Noise Control

1. CONTRACTORS shall ensure that all construction equipment utilized include noise-reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer of such equipment.
2. CONTRACTORS shall review and be knowledgeable of any CEQA documentation for this project restricting or limiting noise and implement any and all scheduling or mitigation methods necessary to conform with the CEQA documents. This includes any Mitigated Negative or Negative Declaration instrument the OWNER has produced.
3. CONTRACTORS shall review and be knowledgeable of any federal, state or local agency requirements for noise restrictions and adhere to the policies outlined by the applicable laws and codes.

N. Pollution Control

1. Provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.

O. Exterior Enclosures

1. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for materials, to allow for temporary heating and maintenance or required ambient temperatures identified in individual specification

Sections and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

P. Access Roads

1. Provide and maintain access to fire hydrants, free of obstructions.
2. Existing on-site roads may be used for construction traffic.
3. CONTRACTORS may not park or drive on concrete walks or in the buildings at any time.

Q. Progress Cleaning

1. Maintain areas free of waste materials, debris and rubbish.  
Maintain site in a clean and orderly condition.
2. Each applicable CONTRACTOR shall remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces prior to the space being enclosed.
3. Each applicable CONTRACTOR shall broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
4. Remove waste materials, debris and rubbish from site periodically and dispose off-site.

R. Fire Protection

1. Fire protection during construction shall be provided in accordance with CFC, Chapter 33.

END OF SECTION



PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
  - 1. Water Control
  - 2. Dust Control
  - 3. Erosion and Sediment Control
  - 4. Noise Control
  - 5. Pollution Control

1.02 PROJECT CONDITIONS

- A. Project Environmental Requirements
  - 1. Water Control
    - a. Do not permit surface or subsurface water or other liquids to accumulate in or about the premises and vicinity thereof. Should such conditions be encountered or develop, control the water or other liquid and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams or other methods as approved by the ARCHITECT and/or the authority having jurisdiction.
  - 2. Dust Control
    - a. Conduct earthwork operations in a manner to prevent windblown dust and dirt from interfering with the progress of the Work, the OWNER'S activities and the existing occupied structures in the areas immediately adjacent as well as adjacent properties.
    - b. Periodically water construction areas as required to minimize accumulation of dust and dirt.
    - c. Water spray or cover with tarpaulins truckloads of soil to additionally minimize generation of dust and dirt from construction operations.
    - d. Prevent dust and dirt from accumulating on walks, roadways, parking areas and from washing into sewer and storm drain lines.

3. Erosion and Sediment Control
  - a. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.
  - b. Minimize amount of bare soil exposed at one time.
  - c. Provide temporary measures such as berms, dikes and drains to prevent water flow over adjacent properties or City rights-of-way.
  - e. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
  - f. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
4. Noise Control
  - a. Avoid excessive noise where adjacent operations may be detrimentally affected.
5. Pollution Control
  - a. Provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.
  - b. Burning of refuse, debris or other materials will not be permitted on the Site.
  - c. Comply with regulatory requirements and anti-pollution ordinances during the course of construction and disposal operations.
6. Removal
  - a. Remove all temporary control measures in accordance with regulatory requirements at the completion of construction.

END OF SECTION

section 01 57 23  
storm water pollution prevention

PART 1 - GENERAL

1.01 SUMMARY

- A. The School District will be filing with the State of California, State Water Resources Control Board a Notice of Intent (N.O.I.) to comply with the terms of the General Permit to Discharge Storm Water Associated with Construction Activity, prior to the beginning of construction on this site.
- B. A copy of the SWPPP will be on file at the Architect's office for review by the contractors during the bidding period. The Contractor will need to implement and monitor the storm water pollution prevention plan prepared for this site. The contractor will be required to review the storm water pollution prevention plan and to identify possible pollution sources and mitigation measures with all subcontractors at their starting of work on site.
- C. The Contractor will be obligated to comply with the requirements of the State's General Permit. Any fines or penalties due to failure to comply with the general permit shall be borne by the Contractor.
- D. Prior to construction and after commencement of construction activities, revisions to the SWPPP shall be submitted, by the Contractor, to the Architect for amendment to the general permit by the preparer of the SWPPP.
- E. The contractor will perform storm water pollution prevention plan testing and reporting until the Owner reassigns such responsibility.

1.02 QUALITY ASSURANCE

- A. Codes and Standards
  - 1. Title 24, Part 2 C.C.R, 2016 C.B.C. Chapter 18A.
  - 2. State of California State Water Resources Control Board Regulations.
  - 3. Prevent the pollution of storm water runoff from the construction activities as required through local ordinances.

1.03 SUBMITTAL

- A. Comply with pertinent provisions of the general permit.

## PART 2 – PRODUCTS

Not Used

## PART 3 – EXECUTION

### 3.01 SURFACE CONDITIONS

- A. 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.

### 3.02 INSTALLATION

- A. Installation of the work shall be as indicated on the drawings as specified herein and regulatory requirements.
- B. Maintain the protection up to the project completion.

### 3.03 CLEANING

- A. During and upon completion of the work comply with the general provisions of the general permit.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
  - 1. Products
  - 2. Transportation and Handling
  - 3. Storage and Protection

1.02 SYSTEM DESCRIPTIONS

- A. Products
  - 1. Products: Means new material, machinery, components, equipment, fixtures and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
  - 2. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
  - 3. Provide interchangeable components of the same manufacturer for similar components.
  - 4. The ARCHITECT may reject as non-complying such material and products that do not bear identification satisfactory to the ARCHITECT as to manufacturer, grade, quality and other pertinent.
  - 5. In event of damage, promptly make replacements and repairs to the approval of the ARCHITECT and at no additional cost to the OWNER.
  - 6. Additional time required to secure replacements and to make repairs will not be considered by the ARCHITECT to justify an extension in the Contract Time of Completion.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading
  - 1. Transport and handle products in accordance with manufacturer's instructions.

2. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement or damage.
- B. Acceptance at Site
1. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Storage and Protection
1. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.
  2. For exterior storage of fabricated products, place on sloped supports, above ground and protect as necessary to prevent deterioration or damage to the product.
  3. When approved by the OWNER, provide off-site storage and protection in a bonded warehouse approved by OWNER when site does not permit on-site storage or protection at no cost to the OWNER.
  4. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
  5. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
  6. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement or damage.
  7. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- D. Waste Management and Disposal

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to work of this section.

1.02 DESCRIPTION OF REQUIREMENTS

- A. Definitions: Project closeout is the term used to describe certain collective project requirements, indicating completion of the work that are to be fulfilled near the end of the contract time in preparation for final payment to the Contractor and the normal termination of the Contract.
  - 1. Specific requirements for individual units of work are included in the appropriate sections in Division 22 through 33.
- B. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single time period for the entire work or a series of time periods for individual elements of the work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

1.03 PREREQUISITES TO SUBSTANTIAL COMPLETION

- A. General: Complete the following before requesting the Architect/Engineer's inspection for certification of substantial completion, either for the entire work or for portions of the work. List known exceptions in the request.
- B. In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed, show either 100% completion for the portion of the work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the work being incomplete.
  - 1. Include supporting documentation for completion as indicated in these contract documents.
- C. Submit a statement showing an accounting of changes to the contract sum.
- D. Advise Owner of pending insurance change-over requirements.
- E. Deliver tools, spare parts, extra stock of material and similar physical items to the Owner.
- F. Make the final change-over of locks and transmit the keys to the Owner. Advise the Owner's personnel of the change-over in security provisions.

- G. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups and similar elements.
- H. Complete final cleaning up requirements, including touch-up painting of marred surfaces.

#### 1.04 INSPECTION PROCEDURE

- A. Upon receipt of the contractor's request for inspection, the Architect/Engineer will either proceed with inspection or advise the contractor of unfilled prerequisites.
- B. Following the initial inspection, the Architect/Engineer will either prepare the certificate of substantial completion, or will advise the Contractor of work which must be performed before the certificate will be issued. The Architect/Engineer will repeat the inspection when requested and when assured that the work has been substantially completed.
- C. Results of the completed inspection will form the initial "punch list" for final acceptance.

#### 1.05 PREREQUISITES TO FINAL ACCEPTANCE

- A. General: Complete the following before requesting the Architect/Engineer's final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions, if any, in the request.
  - 1. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
  - 2. Submit a certified copy of the Architect/Engineer's final punch list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Architect/Engineer.
  - 3. Submit consent of surety.
  - 4. Submit a final liquidated damages settlement statement, acceptable to the Owner.
- B. Re-inspection Procedure: The Architect/Engineer will re-inspect the work upon receipt of the Contractor's notice that the work including punch list items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the Architect/Engineer.
  - 1. Upon completion of re-inspection, the Architect/ Engineer will either prepare a certificate of final acceptance, or will advise the



Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.

2. If necessary, the re-inspection procedure will be repeated.

#### 1.06 RECORD DOCUMENT SUBMITTALS

- A. General: Specific requirements for record documents are in the individual sections of these specifications. Other requirements are indicated in this section. General submittal requirements are indicated in the various submittals" sections.
  1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect/Engineer's reference during normal working hours.
- B. Record Drawings: Specific requirements are indicated in the section of project record documents. In addition to, maintain record shop drawings and submittals a clean, undamaged condition, mark up the record documents where the actual installed work varies substantially from the work originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for mark up, record a cross reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.
- C. Record Specifications: Maintain one complete copy of the Project Manual including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction. mark these documents to show substantial variations in the actual work performed in comparison with the text of the specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.
  1. Upon completion of the work, submit record specifications for the Architect/Engineer for the Owner's records.
- D. Record Product Data: Maintain one copy of each product data submittal. Mark these documents to show significant variations in the actual work performed in comparison with the submitted information. Include both variations in the products as delivered to the site, and variations from the manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark up of record drawings and specifications.

1. Upon completion of mark up, submit complete set of record product data to the Architect/Engineer for the Owner's records.
- E. Record Sample Submitted: Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Architect/Engineer and the Owner's personnel, if desired, to determine which, if any, of the submitted samples that have been maintained by the Contractor during progress of the work, are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's sample storage area.
- F. Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record keeping and submittals in connection with the actual performance of the work. Immediately prior to the date or dates of substantial completion, complete or filed, ready for continued use and reference. Submit to the Architect/Engineer for the Owner's records.
- G. Maintenance Manuals: Organize operating and maintenance data into a format required by owner and in suitable sets of manageable size. Bind data into individual files or documents properly identified and indexed. Mark the appropriate identification suitable to the owner.
1. Include the following types of information in operation and maintenance manuals:
    - Emergency instructions
    - Spare parts listing
    - Copies of warranties
    - Wiring diagrams
    - Recommended "turn-around" cycles
    - Inspection procedures
    - Shop drawings and product data
    - Testing and adjusting procedures
- H. All Prime Contractors to provide 1-year workmanship guarantee; unless a longer warrantee period is specified.

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

### 3.01 CLOSEOUT PROCEDURES

- A. General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instruction in the proper operation and maintenance of the entire work. Where installers are not experienced in the required procedures, include instruction by the manufacturer's representatives.

1. As part of this instruction provide a detailed review of the following items:

- Maintenance manuals
- Record documents
- Spare parts and materials
- Tools
- Lubricants
- Fuels
- Identification systems
- Control sequences
- Hazards
- Cleaning
- Warranties, bonds, maintenance agreements and similar continuing commitments

2. As part of this instruction for operating equipment demonstrate the following procedures:

- Start-up
- Shut-down
- Emergency operations
- Noise and vibration adjustments
- Safety procedures
- Economy and efficiency adjustments
- Effective energy utilization

END OF SECTION

section 01 74 00  
cleaning and waste management

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Provide throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in the section.

1.02 SYSTEM DESCRIPTIONS

- A. Conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.
- B. In addition to the standards described in this section, comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

2.01 CLEANING

A. Cleaning of Materials and Equipment

1. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

B. Compatibility

1. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

C. Progress Cleaning

1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
2. So not allow accumulation of scrap, debris, waste material, and other items not required for construction of this work.
3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

5. Site

- a. Clean daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
- b. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy, or otherwise service arrangements as needed.
- c. Maintain the site in a neat and orderly condition at all times.

6. Structures

- a. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
- b. Weekly, and more often if necessary, sweep interior spaces clean. "Clean" for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a hand-held broom.
- c. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions hereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.
- d. Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials are installed. "Clean" for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material which, in the opinion of the ARCHITECT, may be injurious to the finish floor material.

D. Final Cleaning

- 1. "Clean" for the purpose of this article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.
- 2. Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste.
- 3. Site
  - a. Broom clean paved areas on the site and public paved areas adjacent to the site.
  - b. Completely remove resultant debris.

4. Structures

a. Exterior

1. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
2. Remove all traces of splashed materials from adjacent surfaces.
3. If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
4. In the event of stubborn stains not removable with water, the architect may require light sandblasting or other cleaning at no additional cost to the OWNER.

b. Interior

1. Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
2. Remove all traces of splashed material from adjacent surfaces.
3. Remove paint droppings, spots, stains, and dirt from finished surfaces.

c. Glass

1. Clean inside and outside.

d. Polished surfaces

1. To surfaces requiring routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.

e. Schedule final cleaning as approved by the architect to enable the OWNER to accept a completely clean work.

E. Cleaning During Owner's Occupancy

1. Should the OWNER occupy the work or any portion hereof prior to its completion by the contractor and acceptance by the OWNER, responsibilities for interim and final cleaning shall be as determined by the ARCHITECT in accordance with the General Conditions of the contract.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Preparation and submittal
2. Time and schedule of submittals
3. Guarantee Form
4. Contractor's Certificate Regarding Asbestos Material Form

B. Related Sections

1. 01 77 00 Closeout Procedures
2. (Division 2 through 48) Warranties required for specific products of Work.
3. 01 33 00 Submittal Procedures

1.02 SUBMITTALS

A. Form of Submittals

1. Provide (1) digital version or bind in commercial quality, 8½ x 11 inch, three-ring side binders with hardback, cleanable, plastic covers.
2. Label with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of CONTRACTOR and equipment supplier; and name of responsible principal.
3. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified and the name of the product or work item.
4. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List subcontractor, supplier and manufacturer, with name, address and telephone number of responsible principal.

B. Preparation of Submittals

1. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers and manufacturers, within ten (10) days after completion of the applicable item or work. Except for items put into use with OWNER'S permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.
2. Verify that documents are in proper form, contain full information and are notarized.
2. Co-execute submittals when required.
3. Retain warranties and bonds until time specified for submittal.

C. Time of Submittals

1. For equipment or component parts of equipment put into service during construction with OWNER'S permission, submit documents within ten (10) days after acceptance.
2. Make other submittals within ten (10) days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work when acceptance is delayed beyond Date of Substantial Completion, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty period.

END OF SECTION



## GUARANTEE

We hereby guarantee that the

\_\_\_\_\_, (Item/Equipment)

which we have installed for

\_\_\_\_\_ (Owner)

at

\_\_\_\_\_, (Project name)

has been performed in accordance with the requirements of the Contract Documents and that the work as installed will fulfill the requirements of the Contract Documents.

The undersigned agrees to repair or replace any or all of such work that may prove to be defective in workmanship or material together with any other adjacent work which may be displaced in connection with such replacement within a minimum period of ONE (1) YEAR from the date of acceptance of the above-mentioned project by

\_\_\_\_\_, (Owner) ordinary wear and tear and unusual abuse or neglect excepted.

In the event of the undersigned's failure to comply with the above mentioned conditions within a reasonable period of time, as determined by the OWNER, but not later than ten (10) working days after being notified in writing by the OWNER, the undersigned authorizes the OWNER to proceed to have said defects repaired and made good at the expense of the undersigned, which will pay the costs and charges therefore upon demand.

\_\_\_\_\_ (Contractor)

\_\_\_\_\_ (Signed)

\_\_\_\_\_ (Printed Name)

Representatives to be contacted for service subject to terms of contract.

\_\_\_\_\_ (Name)

\_\_\_\_\_ (Address)

\_\_\_\_\_ (Email)

\_\_\_\_\_ (Phone Number)



CONTRACTOR'S CERTIFICATE  
REGARDING ASBESTOS MATERIAL

This form is to be submitted at the time final billing is provided.

"I certify that all the materials and supplies installed under this contract are free of asbestos-containing materials."

\_\_\_\_\_(Name of Contract)

\_\_\_\_\_(Date)

\_\_\_\_\_(Official Name of CONTRACTOR)

\_\_\_\_\_(By)

\_\_\_\_\_(Title)

\_\_\_\_\_(Signature)

section 02 41 19  
selective structure demolition

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide, in accordance with pertinent provisions of this section, to carefully demolish and remove from the building and site those items scheduled to be so demolished and removed.
- B. Related Requirements: The General Provisions of the contract documents.

1.02 QUALITY ASSURANCE

- A. 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.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Section 01 52 00

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. 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.

3.02 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 Owner, Inspector, Architect visit the site and verify the extent and location of selective demolition required.
  - 1. Carefully identify limits of selective demolition.
  - 2. Mark interface surfaces as required to enable workmen also 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. Completely remove items scheduled to be so demolished and removed, leaving surfaces clean, solid, and ready to receive new materials specified elsewhere.
  - 2. In all activities, comply with pertinent regulations of the California Building Code jurisdiction.
- D. Demolished material shall be considered to be property of the Contractor and shall be completely removed from the job site.
- E. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

### 3.03 REPLACEMENTS

- A. In the event of demolition of items not so scheduled to be demolished, promptly replace such items to the approval of the Architect and at no additional cost to the Owner.

### 3.04 PATCHING AND REPAIR OF EXISTING CONSTRUCTION

- A. Where existing construction is being demolished and adjacent existing construction is to remain, remaining construction shall be patched, repaired and re-finished at areas of demolition / interface with demolished construction. This requirement applies to all conditions, including but not limited to the following:
  - 1. Locations of anchorage / attachment removal
  - 2. Locations where existing construction is to remain exposed following demolition
  - 3. Existing floors, walls and ceilings where finished / exposed to view
  - 4. Removal of restroom fixtures, accessories, partitions, etc.
- B. Patch and repair of existing construction to remain is not required at the following locations:
  - 1. Where existing construction to remain is concealed from view, by either existing finishes/finish systems or new finishes/finish systems.
- C. Existing construction to remain shall be replaced in its entirety when the act of adjacent demolition causes excessive damage to the existing construction, to either the appearance or performance of the existing construction to remain.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide reinforcing steel bars, welded wire fabric, support chairs, bolsters, bar supports and spacers as indicated on the drawings as specified herein and needed for a complete and proper installation.
- B. Related Requirements: The General Provisions of the Contract Documents affecting the work of this Section to include but not necessarily limited to the General Conditions, Supplementary Conditions and Sections of Division 1 of the Project Manual.

1.02 RELATED WORK

- A. Site Concrete.
- B. Formwork.
- C. Cast-in-place concrete.
- D. Concrete Masonry Units.

1.03 QUALITY ASSURANCE

- A. Perform reinforcing work in strict conformance with CRSI 93 unless specified otherwise or required otherwise by local code jurisdiction.

1.04 CODES AND STANDARDS

- A. Title 24, Part 2, C.C.R., 2016 C.B.C., Chapter 19A and applicable Sections.
- B. In addition to CRSI specifications, follow ACI 315 and 318, AWS welding codes and qualifications, and ASTM A185, A305, A615, and A706 and UBC Std. 19.2.
- C. Testing of bars in accordance with Title 24, Section 1916A.2.

1.05 TESTING

- A. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number, and provided the mill analyses accompany the report, then one tensile test and one bend test shall be made from a specimen from each 10 tons or fraction, of each size of reinforcing steel.
- B. Where positive identification of the heat number cannot be made or where random samples are to be taken, then one series of tests shall be made from each 2-1/2 tons or fraction, of each size of reinforcing steel.
- C. Comply with Title 24, Chapter 17A & Section 1916A.2.

- D. Comply with Section 01 45 23 of Division 1.

#### 1.06 STORAGE

- A. Do not allow reinforcing materials to have direct contact with the ground. Cover materials adequately to prevent rusting, and contact with materials or construction injurious to proper bonding.

### PART 2 - PRODUCTS

#### 2.01 REINFORCING BARS

- A. Deformed billet steel bars, ASTM A615, plain finish, grade 60, except for #3 which can be grade 40. ASTM A706 grade 60 for bars to be welded, placed in grade beams, and elsewhere as defined on drawings.

#### 2.02 WELDED WIRE FABRIC

- A. Provide plain type, ASTM A185, in coiled rolls, or flat sheets, plain finished, void of rust, dust, scale, paint, grease and other coatings, conforming to UBC Standard 19-1.

#### 2.03 ACCESSORIES

- A. Provide minimum 16 gauge galvanized annealed tie wires, and chairs, bolsters, bar supports, and spacers sized and shaped for strength and support of reinforcing. Plastic accessories may be acceptable if approved by Architect prior to use.

#### 2.04 FABRICATION AND MANUFACTURE

- A. Fabricate in accordance with details shown.
- B. Accurately bend, cut and place bars as shown on drawings. Bend bars cold; heating of bars is not permissible. Do not bend or straighten bars in any manner that will injure materials. Comply with Title 24, Sections 1907A.2 and 1907A.3.
- C. Welding: All welded reinforcing steel shall be A.S.T.M. A706. Perform welding, where shown or approved, by the direct electric arc process in accordance with AWS D1.4 using 90 series low hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during cooling process; accelerated cooling is prohibited. Do not tack weld bars. Clean metal surfaces to be welded of all loose scale and foreign materials. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds found defective, with chisel, and replace with proper welding. Comply to Title 24, Section 1903A.4.
  - 1. Employ only experienced AWS certified welding operators.

2. Prequalification of welds are to be in accordance with code and carbon equivalent of reinforcing not exceeding 0.75.

### PART 3 - EXECUTION

#### 3.01 INSPECTION

- A. Prior to commencing work of this section, inspect work of others and verify that such work has been properly completed and installed to allow for proper installation of all materials and methods required of this section. Inspection of welding shall be done by a special inspector approved by D.S.A., services retained and paid for by the Owner.

#### 3.02 INSTALLATION

- A. Fabricate reinforcing in accordance with ACI 315. Locate reinforcing splices not shown on drawings, at mid span. Where shown or required, weld reinforcing bars in accordance with AWS D1.4 (2001).
- B. Place reinforcing supported and secured against displacement. Do not deviate from true alignment.
- C. Ensure that reinforcing used is clean, free of scale, dirt, dust, rust and other matter.
- D. Provide a minimum splice for bars noted as "cont.", typical wall reinforcing, no splices in concrete column reinforcing. Provide laps, masonry and concrete per structural drawings/details. Wire all laps and splices in welded wire mesh and provide side and end laps of at least 8 inches.
  1. Spacing - minimum center-to-center distance between parallel reinforcing bars is to be in compliance with that shown on drawings, or in the absence of such information on drawings, the clear spacing is to be 1-1/2 bar diameter, but in no case less than 1-1/2 inch, nor 1-1/3 times the maximum size of aggregate.
  2. Where possible, stagger splices of adjacent bars.
- E. Only splice reinforcing where shown or noted. Splices at other locations must be approved by the Architect or Structural Engineer. Provide continuous reinforcement between splice locations in vertical walls. No splices of vertical wall reinforcing may occur except at foundations, unless specifically approved by the Architect or Structural Engineer.
  1. Securely tie reinforcing with 16 gage tie wire at all splices and intersections, and as may be directed.
  2. Point ends of wire ties away from forms.
- F. Stagger splices in adjacent horizontal wall reinforcing bars a minimum of 4 feet.



- G. Provide dowels in footings and/or grade beams the same size and number as vertical wall or column reinforcing. Provide a minimum dowel protection equal to standard lap splices unless noted otherwise.
  - 1. Secure tie dowels in place before depositing concrete. Install No. 3 bars for securing dowels where no other reinforcement is provided.
- H. Provide the minimum coverage of reinforcing by concrete:

|                        |                    |
|------------------------|--------------------|
| Below grade (unformed) | 3 inches clear     |
| Below grade (formed)   | 2 inches clear     |
| Walls                  | 1 inch clear       |
| Columns, beams         | 1-1/2 inches clear |
- I. Slab-on-grade reinforcing shall be as per the Structural drawings.

### 3.03 CORRECTION DURING CONCRETING

- A. Maintain capable steel workers during placement of concrete for properly resetting reinforcement displaced by runways, workers, or other causes.

### 3.04 DEFECTIVE WORK

- A. The following reinforcing work will be considered defective and may be ordered by Owner to be removed and replaced at no additional expense to Owner.
  - 1. Bars with kinks or bends not shown on drawings.
  - 2. Bars injured due to bending or straightening.
  - 3. Bars heated for bending.
  - 4. Reinforcement not placed in accordance with drawings or specifications.
  - 5. Rusty or oily reinforcement.
  - 6. Re-bent bars.

### 3.05 INSPECTIONS

- A. Prior to pouring concrete, notify the architect, structural engineer and D.S.A. that reinforcing is ready for inspection. Secure approvals by testing laboratory and inspector before concrete operations are commenced.

END OF SECTION

PART 1 - GENERAL

1.01 WORK SPECIFIED IN THIS SECTION

- A. Provide cast-in-place concrete (strengths as indicated on the drawings), finishes, and vapor retarder.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Formwork
- B. Reinforcing

1.03 QUALITY ASSURANCE

- A. Perform concrete work in accordance with ACI 301 and 318, and Title 24, Chapter 19A, Building Code, unless specified otherwise. Provide continuous inspection and testing for concrete placement in accordance with Title 24, Part 1. Project Inspector to provide continuous inspection of reinforcing and concrete placement.
- B. Testing Laboratory Services: In accordance with Section 1905A.6 of Title 24.
- C. Verify compatibility of products and materials listed herein with existing soils conditions as indicated in Geotechnical Report.

1.04 CODES AND STANDARDS

- A. Refer to the following information for compliance of materials, products, and installation techniques: ASTM C33, C94, C150, C260, C494, and ACI 117, 301, 304, and 305, Title 24, 1903A.
- B. Handling and Placing: Concrete transported and placed as per Title 24, 1905A. Concrete shall be thoroughly compacted and worked into forms around reinforcing steel using suitable equipment. Vibrating of formwork will not be permitted.

Where conditions make placing difficult or reinforcing is congested, batches containing the same proportions of sand and cement used in the concrete plus a smaller size aggregate shall be used.

1.05 TESTING

- A. Provide free access to work. Provide laboratory design mix. No substitutions will be accepted. Cement and aggregates shall be tested.
- B. Cement: Test Portland cement in accordance with Sections 1903A and 1916A, Title 24.
- C. Core Tests: Take and test cores in accordance with Section 1905A.6, Title 24.

- D. Aggregate test per 1903A.3, Title 24.
- E. Batch Plant Inspection required for 4000 and 3000 psi concrete and bonded deputy weighmaster affidavit required for 2500 psi concrete per structural drawings, also in accordance with Section 1704A.4.3, Title 24, Part 2. Waiver of Batch Plant Inspection: If noted on the structural plans batch plant inspection may be waived per Title 24, 1704A.4.4. Where allowed, weighmaster is required.
- F. Placing Record: Keep records of placing in accordance with Section 1704A.4.7.

## PART 2 - PRODUCTS

### 2.01 CEMENT

- A. Provide ASTM C150 Type II, low alkali, conforming to 1904A, Title 24. If aggregates contain reactive substances, use Type II. Use Type V if soil contains significant soluble sulfates.
- B. Refer to Structural Drawings and the Geotechnical Report for cement requirements, types and recommendations

### 2.02 AGGREGATES

- A. ASTM C33: 1 inch maximum for 5 inch or thinner slabs, conforming to Title 24, 1903A.3 and grading per ASTM C33, Section 6 and 10. 3/8" aggregate (pea gravel) at planter and ramp walls and at concrete column encasement where sandblasting is scheduled on drawings.
- B. Concrete quality shall conform to Section 1905A, Title 24.

### 2.03 WATER

- A. Provide clean water free from injurious substances.

### 2.04 CURING MATERIALS

- A. Curing Compound: In compliance with Title 24, provide Thompson's Waterseal, or other approved, in accordance with ASTM C309, Type I with fugitive dye, guaranteed to be compatible with finishes to be applied to concrete.
- B. Waterproof Paper: Provide type in conformance with ASTM Type I or II.
- C. Burlap: Provide burlap meeting Federal Specifications CCC-C467B.

### 2.05 VAPOR RETARDER

- A. At concrete floor slabs on-grade, provide 15 mil thick (minimum) HDPE vapor retarder.
  - 1. Visqueen type polyethylene is not acceptable.
- B. All joints shall be taped or sealed

- C. Install per manufacturer's guidelines. Provide all items/products accessory to installation, including tape and/or seam sealant.
- ~~D. Barrier to be placed mid-height in minimum 4" sand layer immediately below the floor slab.~~

#### 2.06 ADMIXTURES (Use only with written approval of Structural Engineer)

- A. Water reducing: Shall conform to ACI 318-05, Section 3.6.5. Reduce water 5 percent minimum, increase 28 day compressive strength, decrease 14 day drying shrinkage. ASTM C494.
  - 1. Provide one of the following, or other approved:  
Master Builders Pozzolith 300.  
Penn-Dixie Chemicals Chemstrong Type A.
- B. Acceleration or retarding: To conform to ASTM C494
- C. Air entraining: 4 percent minimum, 6 percent maximum air content by volume, ASTM C260.
- D. Admixtures shall be in accordance with Title 24, Section 1903A.5.
- E. Concrete Hardener: Hunt LMZ, select Conhard ZM or Shur-Hard M.S.F. distributed by Paul M. Wolff Co.
- F. Non-slip Surface: Trowel finish aluminum oxide grains.

#### 2.07 NON-SHRINK GROUT

- A. Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing non-shrink characteristics in both the horizontal and vertical direction with minimum compressive strength of 2,400 psi in 2 days and 4,000 psi in 28 days.
  - 1. Provide Embecco Grout as manufactured by Master Builders, or other approved by Five Star, Burke, or Sika.

#### 2.08 JOINT MATERIALS

- A. Control Joints: Provide Quick Joint, Zip Strip, or Saw Cut.
- B. Expansion Joints: Provide standard metal keyed dividers for cold joints, subject to review and approval.

### PART 3 - EXECUTION

#### 3.01 MIXES

- A. Strengths: Shall comply with Title 24, Section 1905A.3. Provide concrete mixes which will yield the minimum 28 day compressive strengths required and shown on drawings.

- B. Slumps: Maximum concrete slumps shall not exceed 4". Foundations may be 4" maximum slump.
- C. Selection of concrete proportions: Concrete proportions to be selected using Method B, Title 24, 1905A.

### 3.02 CERTIFICATIONS

- A. Provide legible copies of the delivery tickets of each load of concrete with the following information:
  - 1. Name and location of plant.
  - 2. Serial number of ticket.
  - 3. Date and truck number.
  - 4. Name of contractor.
  - 5. Name of project.
  - 6. Type or class of concrete and how to be used.
  - 7. Amount of concrete.
  - 8. Time loaded, time of arriving and unloading at project site.
  - 9. Water added at site and total water content.
  - 10. Type, name and amount of admixtures.
  - 11. Name and signature of person making slump tests.
  - 12. Testing number of test cylinders.

### 3.03 PREPARATION FOR PLACEMENT

- A. Remove foreign debris and matter which may have accumulated within forms and close ports and openings left in formwork per Section 1905A.7. Provide clean rough construction joints per Section 1906A.4, Title 24.
- B. Thoroughly clean tools used in transportation, placing and consolidating concrete immediately after each pour.
- C. Ensure that required inspections have taken place prior to any pour.

### 3.04 CONVEYING

- A. Handle concrete from mixer to location of placing as rapidly as practical, avoiding separation or loss of ingredients and re-handling. Use carts, wheelbarrows, concrete pumps, conveyors or buggies to deliver concrete to location of placement.
- B. Do not permit a free fall of more than 4 feet when placing concrete.

cast-in-place-concrete

- C. Use elephant truck spouts for placing concrete in vertical elements. Space so that concrete does not exceed 4-foot flow horizontally.

### 3.05 PLACEMENT

- A. In general, place concrete in accordance with ACI 301, Title 24, Section 1905A.10 and in the presence of the inspecting personnel required.
- B. Ensure that anchors, seats, plates, and other items to be cast into concrete are placed, held securely, and will not cause hardship in placing concrete.
  - 1. Place control joints at 20 feet on centers in each direction, maximum, unless shown on drawings.
  - 2. For walks, do not exceed 10 feet on centers, maximum, in each direction.
- C. Maintain records of poured concrete. Record time, date, location, quantity, air temperatures, and test samples taken.
- D. Ensure that reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- E. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
- F. Pour concrete continuously between predetermined construction, control and expansion joints. Pour in a checkerboard pattern, unless otherwise directed.
- G. Excessive honeycomb and embedded debris are not acceptable.
- H. Conform to ACI 305 Title 24, Section 1905A.13 when concreting in hot weather.
- I. Inspect concrete surfaces immediately upon removal of forms. Patch imperfections.
- J. Modify or replace concrete not conforming to required lines, details, shapes and elevations. Do not patch, fill, touch-up, repair, or replace exposed architectural concrete except upon express direction of Architect.
- K. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- L. Install vapor barrier in widest widths possible, under interior slabs on grade, lapping joints at least 12 inches and taping all joints. ~~Cover with at least 2 inches of sand.~~ (Refer to drawings).
- M. Screed slabs and concrete bases level to a tolerance of 1/4 inch in 10 feet, and ACI 117.

- N. Provide smooth rubbed finish on concrete surfaces to be left exposed such as concrete walls, columns, beams, and joists, except as otherwise indicated.
- O. Surface preparation of construction joints shall be by sandblasting or washing 2 to 4 hours after placing concrete per Title 24 Section 1906A.4.1.
- P. Fully vibrate all concrete work.

### 3.06 FINISHING

- A. Provide wood float finish for surfaces to receive waterproof membranes and tile systems.
- B. Provide smooth steel trowel finish at all interior concrete floors and sills of any exterior spandrels.
- C. At walk, ramps and stairs, provide a medium broom finish perpendicular to direction of traffic on all surfaces less than 6% and a heavy broom finish on all surfaces greater than 6%. Make texture heavy for vehicular traffic.
- D. Where exposed aggregates are shown, provide exposure required by architect.

### 3.07 EQUIPMENT BASES

- A. Provide concrete bases for all equipment indicated on drawings.

### 3.08 CURING

- A. Formed concrete: In compliance with Title 24, Section 1905A.11, wet forms thoroughly, including tops and exposed portions of concrete, and keep in thoroughly moist condition until the forms are removed.
- B. Unformed concrete: Water cure as follows:
  - 1. After troweling and as soon as it can be done without marring surface, lay curing paper, lap seams 3 inches and seal with pressure sensitive tape. Keep concrete continuously moist for minimum of 14 days. Leave paper in place as temporary protection as long as possible.
  - 2. Maintain and repair paper for the full curing period and replace evaporated water as required by lifting the edges and wetting the concrete surface to a properly moist condition.
  - 3. Should paper become torn or otherwise damaged, allowing loss of moisture during curing period, immediately repair and keep surface moist by adding water as required to maintain effective, uninterrupted curing.
- C. Use liquid membrane curing at all other locations: Immediately after removing forms and after finishing flat work, apply the specified liquid curing compound in accordance with manufacturer's printed recommendations.

### 3.09 DEFECTIVE CONCRETE

- A. If compressive strength tests of cylinder specimens fail to show strengths assumed in design, take 4 inch diameter cores at representative locations throughout structure as designated by Owner. Take cores to comply with Section 1905A.6.4, Title 24. If results of these tests shown compressive strengths less than assumed in the design with no individual strength test less than 500 psi below that specified, the concrete will be deemed defective. Remove and replace defective concrete in a manner and to such limits as determined by Owner. Be financially responsible for repair and replacement of other in-place materials affected by such removal and replacement. Costs of taking core samples and performing tests required will be paid by Owner if tests prove satisfactory. If tests fail to show required strengths, concrete contractor will be held financially responsible.
- B. If the strength of the molded test cylinder falls below the minimum ultimate compressive strength assumed in the design, adjust the proportions of the mix for the remaining portion of the structure to give concrete of the assumed minimum strength.
- C. Concrete will also be deemed defective which is not formed properly as indicated, is not true to intended alignment, is not plumb or level where so intended, is not true to intended grades, has sawdust or other debris embedded within it, or does not fully conform to other provisions of these specifications. As directed, remove and replace concrete complying with these specifications.

### 3.10 CONSTRUCTION JOINTS

- A. Construction joints shall be prepared in accordance with Section 1906A.4, Title 24.

### 3.10 CONCRETE EMBEDS

- A. Handrail posts shall be set in holes with expansive grout or equivalent (not sulfur).
- B. Provide a #4 rebar on each side of posts in concrete.

END OF SECTION



PART 1 - GENERAL

1.01 SUMMARY

- A. Provide structural framing members, complete with required bracing, weld washers, nuts, shims, anchor bolts, and baseplates.
- B. Related Requirements: General provisions of the Contract Documents to be included but not necessarily limited to General Conditions, Supplementary Conditions, and Sections of Division One of this Project Manual.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Miscellaneous metals.
- B. Non-shrink grout and drypack in Section 03 30 00 (C.I.P. Concrete).

1.03 CODES AND STANDARDS

- A. Refer to the following for information regarding materials and installation methods necessary:
  - 1. American Society for Testing and Materials - Specifications A36, A53 Grade B, A572, A307, A500, A615, A706, and A992. (also listed on SD-1)
  - 2. American Institute of Steel Construction, Steel Construction Manual, 13th Edition.
  - 3. American Welding Society - AWS D1.1 and D1.3
  - 4. Steel Structures Painting Council.
  - 5. Title 24, Part 2, C.C.R., 2016 C.B.C, Ch. 22A.
  - 6. AISC Seismic Design Manual for New Steel Moment Frame Buildings.

1.04 SUBMITTALS

- A. Shop drawings and product data shall be submitted in compliance with the pertinent provisions of the General Conditions and Section 01 34 00.
- B. Submit shop and erection drawings prior to fabrication. Prepare erection drawings by State registered civil engineer. Show welded connections, lengths of welds, profiles, sizes, spacing and locations of all members, attachments, anchorages, framed openings size and type of fasteners, cambers and land loads. Contractor is responsible for dimensions on shop drawings.

1. Splices and deviations: Splices will be permitted only where and as shown on drawings. Deviations from design drawings are to be handled by change order and require approval of the structural engineer and the Division of the State Architect.
- C. Erection and bracing plan and procedure: Refer to Section 1710, Title 8, CCR. Employ a state licensed civil engineer to prepare erection and bracing plan and erection procedure for structural steel including columns, beams, and girders, who will be responsible for compliance. Follow plan and procedure exactly. Keep a copy at project site. The Contractor will pay for costs involved. This submittal will not be reviewed by the Architect or Structural Engineer.

#### 1.05 TESTS AND INSPECTIONS

- A. If structural steel cannot be identified by heat or melt numbers and is accompanied by mill analysis and test reports, testing shall be in accordance with Sec. 2231A.1, Title 24. Identified stock shall be tested also.
- B. If structural steel cannot be identified or its source is questionable, make not less than one tension and one bend test for each 5 tons or fraction thereof for each shape and size.
- C. Furnish test specimens from steel fabricator and take them under the direction of the Testing Agency. Machine each test specimen by Testing Agency to dimensions required by ASTM A370.
- D. Have Testing Agency pick up test specimens and make required tests.
- E. Costs of tests of identified stock will be paid for by Owner, unless tests fail to comply with the specifications, in which case Owner will back-charge the contractor.
- F. Complete a SIX-sided inspection of all steel. Owner will pay for such inspection unless structural steel is not fabricated within twenty-five miles of the project site, in which case Owner will back-charge the contractor.
- G. After fabrication and inspection, costs associated with re-inspection of defective or replaced materials will not be the responsibility of the Owner.
- H. Provide all labor, equipment and facilities necessary for moving and handling materials to be inspected.
- I. Cost for supervision by a registered inspector of all welding operations, including inspection for quality, penetration, and conformity of drawings, and a report verifying that welding is adequate and was done in conformity of all project requirements will be paid for by Owner.
  1. Visually inspect all welds and inspect grouting of column base plates.
- J. Comply with 2212A and 1704A.
- K. Shop fabrication inspections per 1704A.3.2.1.

- L. Comply with Section 01401 TESTING, AND INSPECTION, LABORATORY SERVICES
- M. If inspection is done beyond reasonable distance that requires additional costs, e.g. travel, lodging or overtime for inspection, the Contractor shall reimburse the extra costs to the Owner.

#### 1.06 PROJECT CONDITIONS

- A. Verify measurements, lines, grades, locations and details at project site. Conform to existing actual field conditions.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS AND COMPONENTS

- A. Structural Steel Members: Type for general construction, weldable steel, and as required, shop primed or galvanized where left exposed to elements of weather. Refer to Structural general notes for steel section, type and ASTM designation.
  - 1. ASTM A36/A572 (50 ksi) Dual Steel and A572 (50 ksi) shall also be acceptable for wide flange and WT members.
  - 2. Wide flange members in braced frames and moment frames shall be ASTM A992.
- B. Angles and Channels: ASTM A36
- C. Structural Pipe: Provide ASTM A53, (Type E or S) or A501.
- D. Tube Steel: Provide ASTM A500 Grade B Type.
- E. Hollow Structural Section: Provide ASTM A500 Grade B Type.
- F. Bolts: ASTM A307, U.N.O.
- G. High strength bolts: ASTM A325 or A-490
- H. Comply with Title 24, Section 2204A.2.

#### 2.02 LIGHT STRUCTURAL STEEL

- A. Standard Specifications for Flat-Rolled Carbon Steel Sheets of Structural Quality, ASTM A570 or A611, A446
- B. Standard Specifications for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing, ASTM A53 or Cold Formed Tubing, ASTM A500, Grade B

#### 2.03 WELDING ELECTRODES

- A. Conform to AWS A5.3/A5.4/A5.5 for shielded metal arc welding, Classification E70XX series as required.

## 2.04 GALVANIZING

- A. Provide hot-dip galvanizing in accordance with ASTM A123 G60.
- B. Field galvanizing: Provide ZRC or other approved

## 2.05 PRIMER

- A. Provide Themec 10-99, zinc chromate, or other approved.
- B. Clean, prepare and shop prime members in accordance with SSPC. Do not prime specific surfaces to be welded, surfaces which will be embedded in concrete or other cementitious materials, and surfaces that are concealed from view.
- C. Do not apply primer to structural steel framing members to be encased in cementitious spray-on fireproofing, or those members concealed from view within the building.

## 2.06 OTHER MATERIALS

- A. Provide other materials, not specifically described or indicated but required for a complete and proper installation, as selected by Contractor subject to acceptance by Engineer.

## PART 3 – EXECUTION –

(Note: It shall be this Contractor's responsibility to check bolt template layout and to provide templates.)

## 3.01 SURFACE CONDITIONS

- A. Prior to commencing work of this section, inspect the work of others and verify that such work has been properly completed and installed to allow for proper installation of all materials and methods required of this section.

## 3.02 FABRICATION AND ERECTION

- A. Fabricate and assemble work with skilled personnel using sizes and weights shown. Connections are to be as detailed, unless approved otherwise beforehand. Allow no splices except where shown.
  - 1. Ultrasonic material inspection - ultrasonically test column materials thicker than 1-1/2 inch for laminations within 1 foot (6 inches either side) of a direct groove weld from girder flange connections and column splices.
- B. Drilling, Punching and Reaming: Hole burning to make or enlarge previous holes is not allowed. Prepare required holes in structural steel members for attachment or passage or work of other trades. Where allowed, steel may be punched 1/16 inch larger than the nominal diameter of the bolt when thickness of the steel is equal to or less than the diameter of the bolt plus 1/8 inch. Where the steel is thicker than the diameter of the bolt plus 1/8 inch, the holes

must be drilled or sub-punched and reamed. Diameter of the sub-punched holes, and the drill for sub-drilled holes, is to be 1/16 inch smaller than the nominal diameter of bolt to be installed. Precisely locate finished holes to ensure passage of all bolts through steel assemblies without drifting. Enlarge holes only by reaming. Poor matching of holes is cause for rejection of work.

- C. Welding: Perform welding by the shielded metal arc process. Submerged arc welding and flux-cored arc welding processes are also acceptable. Cut out defective welds with a chisel. Clamp or hold materials securely in position for welding. Upon completion, remove slag and clean welds for inspections and painting. All groove and multi-pass welds are required to be continuously inspected. Welding shall conform to T-24, 1704A.3.1
1. Storage and care of electrodes - Ensure that coatings of low hydrogen type electrodes are thoroughly dry when used. Use electrodes taken from hermetically sealed packages within 4 hours of the time the package is opened. Electrodes not used within this time period, and electrodes which have been exposed more than one hour to air having a relative humidity of 75 percent or greater, are to be dried for at least 2 hours at 200 to 250 degrees F. before used, or are to be reconditioned according to manufacturer's printed recommendations. Electrodes dried or reconditioned which are not used within 4 hours after drying is completed are to be re-dried before use. Electrodes of any classifications that have been wet are not to be used under any conditions.
  2. Preparation - Clean surfaces to be welded of paint, grease, scale, and foreign matter. Clean welds each time electrode is changed. Chip entire area of handguided and controlled flame cut edges before welds are deposited. In general, surfaces made by automatic or mechanically guided and controlled equipment need not be ground or chipped before welded.
  3. Procedures - During assembling and welding, hold components of a built-up member with sufficient clamps or other adequate means to keep parts straight and in close contact. Do no welding in wind until adequate protective screening has been set up. Cut out defective welds or parts of welds with chisel or air arc and replace.
  4. Characteristics of welds - After being deposited, brush welds and ensure they exhibit uniform section, smoothness of weld metal, feather edges without undercuts or overlays, and freedom from porosity and clinkers. Ensure through visual inspection at edges and ends of fillet welds there is good fusion and penetration into base metal.
- D. Bolting
1. Common bolts - make connections with common bolts only where indicated. (ASTM A307 Bolt.)

2. High strength steel bolting - where structural joints are made using high strength bolts, hardened washers, and nuts tightened to a high tension, the materials, method of installation and tension control, types of wrenches to be used, and inspection methods are to conform to specifications for structural jointing using ASTM A325 or A490 bolts established by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation and the following requirement:
  - a. Provide high strength bolts with a suitable identifying mark placed on top of the head before leaving factory.
  - b. Do tightening of nuts with properly calibrated wrenches or turn of nut method; the minimum bolt tension for the size of bolt used is to be in accordance with tables listed in the above standards and as required by AISC in the presence of the resident inspector.
  - c. Check calibrated wrenches individually for accuracy at least once daily for actual condition of application.
  - d. Mark bolts that have been completely tightened with identifying symbol.
  - e. Install hardened washers in accordance with AISC specifications.
  - f. Ensure that contact bearing surfaces and threads of bolted parts are free of scale, slag, and burrs which could prevent solid seating of parts.
  - g. Bolt lengths are to be grip plus 1-1/4 inch.
3. Load indicator washers / Direct tension indicators - provide as manufactured/licensed by TurnaSure LLC, or Valley Forge & Bolt Manufacturing Co. They may be used for field installation of high-strength bolts. These washers may not be substituted for any required washer, but may be used in conjunction with required washers. Tightening is to be in accordance with these specifications using high strength bolts. After sufficient bolts in a joint are snugged to draw the members into close contact, tightening should progress from the most rigid part to the free edges until the load indicators on all bolts are closed to the required gap of 0.015 inches under bolt heads or 0.010 inches under the nuts. To prevent over tightening and damage to the bolts, do not completely close the gap.
4. For alternatives to load indicator washers, see structural drawings.

E. Erection

1. Erect structural steel by professional riggers, using proper hoists and equipment, carefully planned and laid out so that cutting will not be necessary. Erect the work plumb, square and true to line. Provide temporary bracing and guys where necessary to provide for loads and stresses to which the structure may be subjected, including those due to erection equipment and its operation, and leave in place as long as necessary to safeguard all parts of the work.
2. Temporary connections - securely bolt work to maintain the steel in proper position while bolting and welding is being performed. Align, plumb and level all work prior to welding and final bolting.
3. Set column base plates in exact position as to alignment, level and elevation and support on steel wedges or equivalent until grout has properly set. Center of each base is to be true to the column center within 1/16 inch and adjusted to its elevation to 1/32 inch. Exactly level plates on both axis.
4. Sequence - carry out the erection of steel in the proper sequence with the work of others. Frame, bed and anchor to concrete and related work in accordance with detailed drawings and setting diagrams.
5. Erection tolerance - follow AISC except as follows:
  - a. Vertical dimensions - measured from top of beams at their connections at any one column, not varying more than 1/4 inch plus or minus per story or, when accumulative from floor to floor, not exceeding 3/8 inch per story exclusive of column shortening due to dead load.
  - b. Floor level is considered level if all floor framing members on any one floor measured from top of column connections do not vary by more than 1/2 inch plus or minus.
  - c. Plumb displacement - center line of columns from established column line, no more than 1 inch toward or away from established center line.
  - d. Horizontal dimension variances - governed by column displacement.
6. Perform erection with suitable equipment, of adequate capacity and design with due regard for personnel and public safety and as not to deflect or stress members beyond reasonable limits. Maintain erection and temporary bracing plan at project site in accordance with Title 8, California Division of Occupational Safety and Health.

7. Damaged members - during erection, straighten or replace members which are bent, twisted or damaged as directed. If heating is required in straightening, perform heating by methods which ensure uniform temperatures throughout entire member. When directed, remove members which are not damaged to an extent impairing their appearance, strength or serviceability and replace with new members at no additional cost to Owner.
  8. Anchor bolts - provide with setting drawings and instructions. Verify position of bolts prior to delivery of steel; report errors or deviation for adjustment.
- F. Erection Bracing: Provide erection bracing immediately upon erection of members and leave in place until all members are braced by balance of building. Erection bracing is the sole responsibility of the contractor. The Structural Engineer and Architect will not review any erection bracing.
- G. Protection of Floors and Temporary Flooring:
1. Exercise caution to protect floor surfaces and adjacent work from damages. Do not overload floors. Provide only pneumatic tired mobile equipment for moving steel. Do not place steel members directly on concrete floors; use pads, or timbers, or other materials for cushioning.
  2. Provide necessary planking, scaffolding and temporary flooring in connection with erection of steel or support of erection machinery as part of the work. Conform use of temporary floors or steel deck to governing codes and regulations.
  3. Temporarily tack weld steel deck to supports where used as a working platform. Distribute concentrated loading from welding machines or other heavy machinery by planking or other equivalent means. Replace steel deck damaged by using as working platform at no additional cost to Owner.
- H. Shop Priming: Clean surfaces according to SSPC and AISC recommendations, and apply specified primer to minimum 1.0 dry mil thickness. Ensure that primer is worked into joints. Do not prime the following: steel to be embedded into cementitious materials, permanently concealed steel surfaces, contact surfaces of high strength bolted connections, and surfaces to receive fireproofing.

### 3.03 TEST AND INSPECTION

- A. Tests of Structural and Cold Formed Steel - 2212A.1
- B. Welding - 1704A.3.1.
- C. Non-Destructive Weld Testing - 1704A.
- D. H.S. Bolts - 2212A.2



E. End Welded Studs - 2212A.3

F. Shop Fab - 1704A.2

### 3.04 CLEANING

A. Clean site after work of this section.

B. Remove weld splatters

C. Use galvanizing repair coating specified, then re-prime areas of materials damaged during installation and other construction activities, and leave in condition for subsequent finish painting or application of additional finish materials provided by others.

END OF SECTION

PART 1 - GENERAL

1.01 WORK SPECIFIED IN THIS SECTION

- A. Provide structural framing members complete with bracing, weld washers, nuts, shims, anchor bolts.
- B. Related Requirements: General provisions of the Contract Documents to be included but not necessarily limited to General Conditions, Supplementary Conditions, and Sections of Division One of the Project Manual.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Structural steel.
- B. Welding (See Structural Steel Section).
- C. Finish painting.
- D. Substrates to which fabrications are to be embedded.

1.03 CODES AND STANDARDS

- A. American Iron and Steel Institute Specification for the design of cold-formed steel structural members (August 19, 1986, with December 1989 Addendum).
- B. Title 24, Part 2, C.C.R., 2016 California Building Code, Sections 2209A and 2210A.
- C. American Society for Testing and Materials - A653 /A653M-07.
- D. American Welding Society-AWS D1.1/D1.1M:2006, and D1.3/D1.3M:2007.
- E. Steel Structures Painting Code.

1.04 SUBMITTALS

- A. Submit shop and erection drawings prior to fabrication. Show member sizes with sections and section properties, welded connections, lengths and sizes of welds, spacing and locations of all members, attachments, anchorages, framed openings, size and type of fasteners. Contractor is responsible for dimensions on shop drawings.
- B. Each lift or bundle of fabricated elements shall have the grade and the ASTM specification number or other specification designation shall be indicated by painting, decal, tagging or other suitable means. Also the resulting minimum yield point shall be indicated in addition to the specification designation. Reference Title 24, Part 2, 2016 C.B.C, Section 2203A.

- C. The fabricator, in processing steel through his works, shall maintain identity of the material and shall maintain suitable procedures and records attesting that the specified grade has been furnished in conformity with the applicable Uniform Building Code Standard. The ASTM or other specification designation shall be included near the erection mark on each shipping assembly or important construction component over any shop coat of paint prior to shipment from the fabricator's plant. The fabricator's identification mark system shall be established and on record prior to fabrication. Reference Title 24, 2016 C.B.C., Section 2203A.
- D. Steel which is not readily identifiable as to grade from marking and test records shall be tested to determine conformity to such standard. The fabricator shall when requested, furnish an affidavit of compliance with such standard. Reference Title 24, 2016 C.B.C., Section 2203A.3.
- E. Welding of cold-formed steel members shall conform to the requirements of Title 24, Section 2204A.1.
- F. After fabrication and inspection, costs associated with reinspection of defective or replaced materials will be back charged to the contractor.
- G. Provide all labor, equipment and facilities necessary for moving and handling of material to be inspected.
- H. All field and shop welding shall be under the supervision of a special inspector approved by the Division of the State Architect all welding operations, including inspection for quality, penetration, and conformity of drawings, and a report verifying that welding is adequate and was done in conformity of all project requirements. All additional costs of inspection e.g.: travel, lodging, overtime, etc. will be reimbursed to Owner by the Contractor.
- I. Comply with Section 01 45 23 TESTING AND INSPECTING SERVICES

#### 1.06 PROJECT CONDITIONS

- A. Verify measurements, lines, grades, locations and details at project site. Conform to existing actual field conditions. If field conditions do not reasonably comply with those conditions shown on the plan contact the architect.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS AND COMPONENTS

- A. Cold-formed Steel members: Type for general construction, weldable steel, conforming to the requirements of ASTM A653 /A653M-07. Galvanized where exposed to weather.

#### 2.02 WELDING ELECTRODES

- A. Conform to AWS A5.3/A5.4/A5.5 for shielded metal arc welding, Section 2204A.1, Title 24, Classification E70XX series as required.

## 2.03 GALVANIZING

- A. Provide hot-dip galvanizing in accordance with A653 /A653M-07.
- B. Field galvanizing: Provide ZRC, or other approved.

## PART 3 - EXECUTION

### 3.01 SURFACE CONDITIONS

- A. Prior to commencing work of this section, inspect the work of others and verify that such work has been properly completed and installed to allow for proper installation of all material and methods required of this section.
- B. Drilling, Punching and Reaming: Hole burning to make or enlarge previous holes is not allowed. Prepare required holes in structural steel members for attachment or passage of work of other trades. Where allowed, steel may be punched 1/16 inch larger than the nominal diameter of the bolt where thickness of the steel is equal to or less than the diameter of the bolt plus 1/8 inch. Precisely locate finished holes to ensure passage of all bolts through steel assemblies without drifting. Poor matching of holes is cause for rejection of work.
- C. Welding: See Structural Steel Section under Welding.
- D. Erection:
  - 1. Erect cold-formed steel using proper equipment, be laid out so that cutting will not be necessary. Erect the work plumb, square and true to line. Provide temporary bracing where necessary to provide for loads and stresses to which the structure may be subjected, including those due to erection equipment and its operation, and leave in place as long as necessary to safeguard all parts of the work.
  - 2. Temporary connections - securely bolt work to maintain the steel in proper position while bolting and welding is being performed. Align, plumb and level all work prior to welding and final bolting.
  - 3. Sequence-carry out the erection of steel in the proper sequence with the work of others. Frame, bed and anchor to concrete and related work in accordance with detailed drawings and setting diagrams.
  - 4. Perform erection with suitable equipment, of adequate capacity and design with due regard for personnel and public safety and as not to deflect or stress members beyond reasonable limits. Maintain erection and temporary bracing plan at project site in accordance with Title 8, California Division of Occupational Safety and Health.
  - 5. Damaged members-during erection, replace members which are bent, twisted or damaged as directed. When directed, remove members which are not damaged to an extent impairing their appearance, strength or serviceability and replace with new members at no additional cost to the Owner.

cold formed metal framing

- 6. Anchor Bolts-provide with setting drawings and instructions. Verify position of bolts prior to delivery of steel; report errors of deviation for adjustment.
- E. Erection Bracing: Provide erection bracing immediately upon erection of members and leave in place until all members are braced by balance of building.
- F. Protection of Floors and Temporary Flooring: Exercise caution to protect floor surfaces and adjacent work from damages. Do not overload floors. Do not place steel members directly on concrete floors; use pads or timbers, or other material for cushioning.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide miscellaneous metal fabrications such as angles, plates, sheet goods, railings, nosings, ladders, and stairs.
- B. Equipment support system.

1.02 RELATED WORK PER GENERAL PROVISIONS OF THE CONTRACT DOCUMENTS

- A. Structural steel.
- B. Finish painting.
- C. Substrates to which fabrications are to be attached or embedded.

1.03 CODES AND STANDARDS

- A. In addition to mandatory compliance with governing bodies and codes having jurisdiction over the project, provide materials complying with the following standards and industry recommendations: ASTM A36, A47 A48, A53, A108-07, A283, A312, A314-97, A475-03, A512-06, A554-03, B108-06, B209-07, B221-06, SSPC, NAAMM, and AA.
- B. Title 24, Part 2, Chapter 22A, C.C.R., 2016 C.B.C.,

1.04 SUBMITTALS

- A. Submit fabrication shop drawings per the general provisions of the general conditions and Section 01 33 00.
- B. Where other than mill finishes are specified, provide samples of required finish which will be reviewed for color, texture, style, and finish.
- C. Submit mill test reports and chemical analyses of all materials bearing heat numbers not required to be tested, in accordance with other sections of these specifications.
- D. Submit testing results in accordance with other sections of these specifications.
  - 1. Provide one tensile and one bend test for each five tons or fraction, of each shape and size, for all unidentified material.
  - 2. The Owner reserves the right to reject materials, installed or not, which exhibit defects or do not pass inspections or tests.

## 1.05 QUALIFICATIONS

- A. Shop and Field Welding: Welds are to be inspected by a qualified special inspector. Inspections will be paid for by Owner.
- B. For field-weld see T-24, Part 9, CA Fire Code, Article 45 and 8745.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Steel Plates, Shapes and Bars: ASTM A36.
- B. Steel Plates to be bent or cold formed: ASTM A283, Grade C.
- C. Steel Bars and Bar-Size Shapes: ASTM A36, or ASTM A1011.
- D. Steel Tubing (Hot-Formed, Welded or Seamless): ASTM A501.
- E. Steel Tubing (Cold-Formed, Welded or Seamless): ASTM A500 Grade B.
- F. Cold-Finished Steel Bars: ASTM A108, grade selected by fabricator.
- G. Hot-Rolled Carbon steel Sheets: ASTM A1011.
- H. Cold-Rolled Carbon Steel Sheets: ASTM A1008.
- I. Galvanized Carbon Steel Sheets: ASTM A653.
- J. Gray Iron Castings: ASTM A48, Class 30.
- K. Malleable Iron Castings: ASTM A47, grade as selected.
- L. Steel Pipe: ASTM A53, type as selected, Grade B, black finish, standard weight schedule 40.
- M. Steel Wire Rope: ASTM A475, zinc coated steel wire strand, size and number of wire required, common grade with Class B zinc coating.
- N. Expanded Steel Grating: ASTM B209-07, alloy 5052.
- O. Aluminum Extrusions: ASTM B221, alloy 6063-T5 except alloy 6063-T6 for pipe.
- P. Aluminum Sheet or Plate: ASTM B209-07, alloy 6061-T4, mill finish.
- Q. Aluminum Castings: ASTM B108, alloy 214.
- R. Stainless Steel Castings: ASTM A296, CF8 or CF20.
- S. Stainless Steel Pipe: ASTM A312.

- T. Stainless Steel Tube: ASTM A554, Type 302/304.
- U. Stainless Steel Bars: ASTM A314, Type 302/304.
- V. Shop Primer: Tnemec 10-99, or other approved.
- W. Field Galvanizing: Provide ZRC Chemical, or other approved.
- X. Arc Welding Electrodes: E70.
- Y. Bolts and Nuts: ASTM A307 and A325.

## 2.02 FABRICATION

- A. Verify actual field dimensions prior to any fabrication.
- B. Fabricate items with joints neatly fitted and properly secured.
- C. Fit and shop assembly in largest practical sections for delivery to site.
- D. Grind exposed welds smooth and flush with adjacent finished surfaces.
- E. Exposed mechanical fastenings: Flush countersunk screws or bolts unobtrusively located, consistent with design of structure, except where specifically noted otherwise.
- F. Make exposed joints flush butt type hairline joints where mechanically fastened.
- G. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified or shown.
- H. Thoroughly clean surfaces of rust, scale, grease and foreign matter prior to prime painting and galvanizing.
- I. Galvanize all miscellaneous metal fabrications exposed to view, and prime paint all other items. Do not shop prime surfaces in direct contact with concrete or other cementitious materials, or requiring field welding. Shop prime in two coats. Provide minimum G90 galvanized coating where galvanizing is required.

## 2.03 MANUFACTURED FABRICATIONS

- A. Ladders: Meet or exceed State Industrial Construction Safety Orders and OSHA.
  - 1. Aluminum: Serrated rung Model 500-SL Standard Access Ladder as manufactured by O'Keefe's Inc., San Francisco; Dur-Red Products, Los Angeles, or equal as approved by the architect.
  - 2. Steel: As detailed on drawings -- 2-1/2" x 3/8" side rails and braces; 3/4" round rungs. Galvanized after fabrication.



- B. Roof Ladder Accessories: provide Bilco LU-2 "Ladder-Up" safety post at the top of all roof access ladders.
- C. Roof access shall be provided from interior spaces, exterior ladders shall not be permitted.

### PART 3 - EXECUTION

#### 3.01 SURFACE CONDITIONS

- A. Inspect surfaces and work in place by others, and verify that such work is in a conditions appropriate to receive work of this section. Do not apply or install work of this section until unsatisfactory work of others is in a condition which will ensure the correct installation of materials and products of this section.

#### 3.02 INSTALLATION

- A. Obtain approval of architect prior to site cutting or making adjustments which are not part of intended work, or are not shown on shop drawings.
- B. Install items square and level, accurately fitted and free from distortion and defects.
- C. Make provisions for erection stresses by temporary bracing. Keep work in alignment.
- D. Replace items damaged during installation.
- E. Perform field welding in accordance with AWS D1.1.
- F. After installation, touch-up field welds and scratched and damaged paint, or coated surfaces. Use primer consistent with shop finish.
- G. Supply and assist with setting all items requiring to be cast into concrete, or embedded in masonry, complete with necessary setting templates.

#### 3.03 CLEANING

- A. Clean site after work of this section.
- B. Remove weld splatters.
- C. Use galvanizing repair coating specified, then re-prime areas of materials damaged during installation and other construction activities, and leave in condition for subsequent finish painting or application of additional finish materials provided by others.

END OF SECTION



PART 1 - GENERAL

1.01 SUMMARY

- A. Provide the work specified herein consisting of wood framing, wood roof, miscellaneous furring for walls and ceiling finishes, miscellaneous blocking, nails, bolts, screws, framing anchors and other rough hardware and needs for construction as indicated on the drawings for complete and proper installation.
- B. Related Requirements: The general provisions of the contract documents.

1.02 RELATED WORK

- A. Glu-laminated beams.
- B. Engineered Wood Products.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled personnel 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.
- B. Provide lumber with visible grade stamp of an approved agency certified by NFPA.
- C. All structural glued laminated timber shall be continuously inspected during fabrication by an inspector specially approved by D.S.A. An AITC Certificate will not meet this requirement.

1.04 CODES AND STANDARDS

- A. Testing and inspections: in accordance with Section 1704A.6 of Title 24, C.B.C., 2016 C.B.C.
- B. PS 20 - American Softwood Lumber Standard.
- C. NFPA - National Forest Products Association National Design Specifications for Wood Construction, 1995 Edition and Supplement.
- D. Western Lumber Grading Rules (in conformance with PS20-94).

1.05 STORING AND HANDLING

- A. Deliver and store materials at job site in a safe area, out of traffic and shored up off ground surface.
- B. Identify framing lumber by grades and store grades separately from each other.
- C. Protect products with adequate waterproofing.

- D. Exercise care in off-loading lumber to prevent damages splitting and breaking.

#### 1.06 SEASONING

- A. Deliver materials at earliest date possible to allow maximum drying time on site.
- B. Pile and strip lumber at site to allow free circulation of air with pile protected from sun and moisture.
- C. Air-season all lumber for at least 30 days before covering with finish materials. Moisture content of lumber when installed shall be 19% or less, to be field verified.

### PART 2 - PRODUCTS

#### 2.01 LUMBER

- A. All lumber shall be Douglas Fir with grades as specified on the drawings. All lumber shall be graded in accordance with Grading and Dressing Rules #17 of the WCLIB and shall bear a grade stamp.
- B. All plywood sheathing shall be STRUCT I, with exposure 1 glue and shall be grade stamped with the appropriate APA stamp (except B-D for electrical and telephone panels). Do not use any sheet less than 8 square feet, nor less than 2 feet in any dimension. Provide minimum 1/2-inch plywood unless noted otherwise on the drawings.
- C. Depth-to-thickness ratio of horizontal members shall not exceed 7.
- D. Comply with Chapter 23A of Title 24.

#### 2.02 ACCESSORY MATERIALS

- A. Nails, spikes, and staples: Common (with standard lengths), except as otherwise indicated, galvanized for exterior locations, high humidity within conditioned spaces, and treated wood: plain finish for other interior locations; size and type to suit application.
- B. Steel hardware and stock framing connectors: ASTM A36 steel, galvanized for exterior applications, Simpson, or other approved manufacturer. Title 24, Sec. 2325A. Use of manufactured connectors other than specific brand and catalog no. shown on plans requires D.S.A. approval.
- C. Lag bolts and wood screws: ASTM 446 Grade A.
- D. Machine bolts: ASTM A307.
- E. Wood preservative: Wolmanizing treatment at least two weeks prior to delivery to site.

- F. Pressure treatment: Sills and plates in contact with concrete or masonry, and within 48 inches of ground are to be pressure treated, per Title 24, Part 2, Section 2303A.1.8.

## 2.03 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

## PART 3 - EXECUTION

### 3.01 SELECTION OF LUMBER

- A. Carefully select all members. Ensure that exposed members are free of heart center. Select members so that knots and obvious defects will not interfere with placement of bolts, proper nailing or making proper connections, and not impair achievement of proper finished appearances where to be exposed.
- B. Cut out and discard defects which will render a piece unable to serve its intended function. Lumber may be rejected by architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

### 3.02 GENERAL FRAMING

- A. In addition to framing operations normal to fabrication and erection indicated on drawings. install all wood backing required for other work of other trades, and for casework, chalkboards, toilet partitions, etc. as required.
- B. Set all horizontal and sloped members with crown up.
- C. Non-bearing, non-shear stud walls, sills, and trimmers may be anchored to concrete with shot pins. Use bolts set in concrete when edge distance at concrete is less than 3 inches. No shot pins permitted at curb conditions.
- D. All wall and partition studs and mullions shall be continuous from sill to plates. Run at least two studs on each side of openings in stud walls for openings in exterior walls and in partition openings larger than 6 feet, and partitions from sill to plate. For additional details, see structural drawings.
- E. Double plates with all joints staggered and lapping at least four feet, and splice.
- F. Install nailing blocks and backing necessary for attachment of grounds, finishes, trim, fixtures, and do all required cutting, furring, and backing for plumbing and heating pipes, fixtures, etc.
- G. Frame stud partitions, furring and walls containing fire cabinets, electric panels, plumbing, heating, or other pipes to give proper clearance. Cutting of studs in bearing partitions and shear walls is prohibited unless specifically detailed.

- H. Do not place pipes exceeding 1/3 of plate width in partitions used as bearing or plywood sheathed walls, but place them in furring completely clear of studs, unless detailed otherwise. Place approved piping in center of plates using neat hole. No notching is allowed. In no case allow pipes to pass through plates less than 5-1/2 inches wide.
- I. Unless otherwise indicated, provide 2 x 6 studs at 16 inches on centers.
- J. Provide cross-bridging at 8 feet on centers maximum for all joists and rafters more than 8 inches (4" @ floor joists) depth. Use 2 by 3 wood or approved nailable metal type bridging.
- K. Provide 1 inch by 6 inch let-in bracing (at approximately 45 degrees) every 25 feet in all stud walls not sheathed. Run continuous from top plate to sill plate. (Optional; for alignment purposes only).
- L. Provide all isolated posts with connections at top and bottom; Simpson CC caps or CB base unless specifically detailed otherwise.
- M. Double joist under parallel partitions with solid blocking between joist over all points of support.
- N. Provide a 1/16 inch thick galvanized sheet steel base plate for all untreated wood posts where they are or will be in contact with concrete.
- O. Do not cut or notch wood members unless specifically detailed on drawings.
- P. Retighten all bolts, lags, screws, etc., prior to closing-in.
- Q. Exterior wood wall sills shall be set on 6" high concrete curbs.
- R. Use Simpson or equal connecting hardware, hold-downs, and etc. Standardize on a few sizes to minimize number of different types.
- S. All wood exposed to weather or in contact with soil and all wood bearing on concrete or masonry is less than 4' above grade shall be pressure treated Douglas Fir.
  - 1. All pressure treated wood with drilled holes or cuts shall be coated with 2 heavy coats of 2% copper naphanete solution.

### 3.03 FIRE STOPS

- A. Ensure that no fire stop is less than 2 inches thick and no less in width than enclosed space within partition.
- B. Provide stud wall and partitions with continuous rows of bridging or fire stops which will form a complete and effective separation in entire width of partitions, placed in such a manner that there will be no concealed air spaces greater than 8 feet in vertical dimension. Intermediate stops may be in line with opening headers. Provide furred space between stud walls and partitions with continuous fire stops at same elevation as those in the enclosing walls which must be installed horizontally, thus forming a solid stop from outside to outside

of studs. At all concealed draft passages or shafts including furring spaces, ensure that maximum dimension is no more than 8 feet. Fire stop all partitions at all suspended ceilings.

### 3.04 DRAFT STOPS

- A. Construction materials shall be of the following materials:
  - 1. Minimum 1/2" Gypsum board.
  - 2. Minimum 3/8" Wood structural panel.
  - 3. Minimum 3/8" Type 2-M particle board.
- B. Installation shall be at locations indicated on the drawings and per the following requirements:
  - 1. At roof-ceiling assemblies so that the area of the concealed space does not exceed 1000 sq. ft. with a maximum horizontal dimension of 60 feet.
  - 2. At roof-ceiling assemblies, where automatic fire sprinklers are installed in the concealed space, so that the arm of the concealed space does not exceed 3,000 sq.ft. with a maximum horizontal dimension of 100 ft.
  - 3. In attics, mansards, overhangs, false fronts set out from walls and similar concealed spaces so that the area between draft stops does not exceed 3000 sq.ft. with a maximum horizontal dimension of 60 ft.
    - a. Where automatic fire sprinklers are installed in the aforementioned spaces, the maximum area between draft stops shall be 9,000 sq.ft. with a maximum horizontal dimension of 100 feet.
  - 4. Draft stops shall form an effective barrier in concealed attic spaces, between ceilings and the underside of roof sheathing.

### 3.05 BEARINGS

- A. Make bearings full unless shown otherwise.
- B. Finish bearing surfaces on which structural members are to rest so as to give sure and even support. Where framing members slope, cut or notch ends as required to give uniform bearing surface.

### 3.06 SHIMMING

- A. Do not shim any framing member except where specifically shown or required by drawings.

### 3.07 BLOCKING

- A. Install blocking required to support all items of finish and to cut off all concealed draft openings, both vertical and horizontal, between ceiling and floor.

- B. 2x full depth solid blocking, shall be placed between joist or rafters at all supports.

### 3.08 ALIGNMENT

- A. On all framing members to receive a finished surface, align finish sub-surface to vary not more than 1/8 inch from plane of surface of adjacent framing and furring members.

### 3.09 PLYWOOD PLACEMENT

- A. Place all plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise detailed.
- B. Center joints accurately over support unless otherwise shown on drawings.
- C. Protect plywood from moisture until succeeding component or materials are installed to cover plywood.

### 3.10 FASTENING

- A. Use only common wire nails or spikes (unless noted otherwise) of standard lengths and gages as specified in Title 24, Part 2, 2016 C.B.C., Table 2304.9.1.
- B. For conditions not covered on drawings, provide penetration into piece receiving point not less than 1/2 length of nail or spike, provided that 16d nails may be used to connect two pieces of two inch thickness.
- C. For bolts, drill holes 1/32 inch larger in diameter than bolts being used. Drill straight and true from one side only.
- D. Bolt threads shall not bear on wood. Use washers under head and nut where both bear on wood. Use washers under all nuts.
- E. For lag screws, and wood screws, pre-bore holes same diameter as root of threads; enlarge holes for shank diameter for length of shank.
- F. Screw, do not drive, all lag screws, sheet metal screws, and wood screws.
- G. Retighten bolts before closing.

END OF SECTION



PART 1 - GENERAL

1.01 SUMMARY

- A. This work includes the complete furnishing and installation of all web wood joists, including framing hardware, as shown on the drawings, herein specified and necessary to complete the work.
- B. Related Requirements: General Provisions of the Contract Documents to be included but not necessarily limited to General Conditions, Supplementary Conditions, and Sections of Division One of this Project Manual.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Rough Carpentry.
- B. Glue Laminated Beams.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Plywood web joist shall be from manufacturers as follows:
  - 1. RedBuilt. The joists shall be manufactured in accordance with the provisions of ICC ESR#2994 and DSA PA-048, and shall be of the size and designations shown on the drawings.
  - 2. Any alternate wood joists shall meet the same design criteria as indicated on the plans. The alternate joist Stiffness measured as EI, shall be equal to or greater than those joists specified on the drawings.
- B. Design of alternate wood joist: The wood joist manufacturer shall custom design the joists to fit the dimensions and loads indicated on the plans and any additional loads that may be required. All designs shall be in accordance with allowable values and section properties assigned and approved by the Building Code. Design shall conform to the requirements of Chapter 16A and 23 of Title 24, Part 2, CCR. Manufacturer's registered civil engineer shall supervise joist design and provide calculations for all plywood web joists. The Structural Engineer-of-Record shall be responsible for the review and approval of the alternate design. The contractor shall be responsible for obtaining approval for the alternate product from the Architect and Engineer-of-Record and from the Division of the State Architect. The cost for approval of an alternate design shall be borne by the Contractor.
- B. Lumber grading: In conformance with I.C.C. accepted manufacturer's mechanical stress rating system.
- C. Fabrication plant: Approved by I.C.C. certified testing agency.
- D. Continuous inspection of fabrication by designated independent inspection agency, approved by D.S.A. and architect, retained and fees paid by the Owner.

E. Joists shall be identified by a stamp indicating the joist type, ICC report number, manufacture name, plant number and the PFS Corporation logo and their report number.

F. Comply with Section 01 45 23 TESTING AND INSPECTION SERVICES

#### 1.04 SUBMITTALS

A. Comply with the pertinent provisions of the General Conditions and Section 01 33 00.

B. General: Do not proceed with fabrication until shop drawings and calculations have been reviewed and approved by the architect and engineer.

C. Shop drawings and calculations: Shop drawings showing layout and detail necessary for determining fit and placement in the building shall be provided by the manufacturer. Provide design calculations sealed and stamped by a licensed structural engineer in California that show the design criteria has been met.

D. Lab Instructions: Include laboratory test reports and other data to show compliance with specifications and referenced standards.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 52 00.

B. Delivery Storage.

1. Deliver the units to the job site with adequate wrapping per manufacturer's requirement to prevent damage and moisture damage. Transport and store joists in a vertical position resting on bearing ends.

2. Maintain wrapping in proper condition until unit erection.

3. Damaged units are subject to rejection by the Structural Engineer and shall be removed from the job site at time of rejection.

#### 1.06 WARRANTY

A. The products delivered will be free from any defects in workmanship or materials and the manufacturer of members shall be adequate to carry the loads specified by the purchaser for the life of specified project.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Structural wood chord members shall be min. 1-1/2" thick, FT=2400 psi min, E=2.0 x 10 psi of approved grade and kiln dried to a maximum moisture content of 16%. All end joints shall be finger joints conforming to details approved by the Division of The State Architect.
- B. Plywood web trusses shall utilize structural 1 plywood, CD grade, web material conforming to PS 1-95.
- C. All roof framing shall be sloped a minimum of 1/2-inch per foot.
- D. All lumber materials shall be certified by the Forest Stewardship Council (FSC).

### 2.02 FABRICATION

- A. The joist products shall be manufactured in a plant approved for fabrication by the Division of the State Architect and under the continuous inspection of an independent inspector approved by D.S.A.

### 2.03 IDENTIFICATION

- A. Each of the joists shall be identified by a stamp indicating the joist type, NER report number, manufacturer's name and plant number.

## PART 3 - EXECUTION

### 3.01 ERECTION AND INSTALLATION

- A. The joist, if stored prior to erection shall be stored in a vertical position and protected from the weather. They shall be handled with care so they are not damaged. The joists are to be erected and installed in accordance with the plans, drawings and installation suggestions of the manufacturer. Temporary construction loads beyond limits indicated thereon are not permitted. Erection bracing in addition to specified bridging is to be provided by the manufacturer as detailed on shop drawings to keep the joist straight and plumb as required and to assure adequate lateral support for the individual trusses and entire system until the sheathing material has been applied.

### 3.02 PERFORMANCE

- A. Products shall be proven by testing as demonstrated either by I.C.C. and NRB acceptance.

### 3.03 FIRE RATINGS

- A. Provide written verification that installed system will provide fire resistive assembly as specified and/or as shown on the drawings.

### 3.04 WARRANTY

- A. The products delivered will be free from any defects in workmanship or materials and that the design of members shall be adequate to carry the loads specified by the purchaser for the life of specified project.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide and install finish milled wood exterior and interior wood trim and miscellaneous finish wood items as indicated on the drawings and specified herein.
- B. Installation of, but not necessarily limited to, as applicable: Paneling and millwork, plastic covered casework, laminated plastic countertops, plastic covered wall paneling, doors, finish hardware, caulk and sealants.
- C. Related Requirements: Pertinent provisions of the contract documents affecting the work of this section are not necessarily limited to the General Conditions, Supplementary Conditions and Sections of Division One in this project manual.

1.02 QUALITY ASSURANCE

- A. Provide skilled personnel 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.
- B. The finish carpentry, millwork shall be in compliance with W.I. standards "Manual of Millwork" latest edition, "Custom Grade" as specified herein or indicated on the drawings.
- C. Before delivery to the project job site, the millwork shall be W.I.C. certified in compliance fully meeting the requirements of grade or grades specified.

1.03 CODES AND STANDARDS

- A. Title 24 Part 2 C.C.R., 2016 C.B.C. (Chapter 8 as applicable)
- B. WI - Woodwork Institute

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance to the General Conditions and Section 01 33 00.
- B. Shop drawings shall bear the W.I. Certified Compliance Label on the first page of the drawings.
- C. Submit samples of each species of finish wood 8 x 10 inches minimum and other miscellaneous item required to provide a complete product as indicated on the drawings.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of Section 01 52 00.
- B. Deliver all materials when the project is ready for installation. A clean storage area is required in compliance with W.I. Section 1, Item 7 as recommended care and storage of architectural millwork to be furnished to the General Contractor for space required.
- C. Do not store millwork outside the building following fabrication and prior to installation.
- D. Exercise care in off-loading items to prevent damage, chips, splitting and breaking.
- E. Any damage shall be subject to rejection.

## PART 2 - PRODUCTS

### 2.01 FINISH LUMBER AND MILLWORK

- A. Architectural millwork specified herein shall comply with Section 26 of WI "Manual of Millwork" for exterior and interior applications as indicated on the drawings.
- B. Lumber surfaces visible after fabrication shall comply with grade rules for species of natural sound lumber, free of decay, shake, pith, wane and warp.
  - 1. Interior and Exterior Ceiling / Wall paneling
    - a. 1 x 4 T&G Red Cedar, beveled edge, saw texture exposed. Provide stain sealer.
- C. Fire Retardant Wood: At all rated exit corridors, and at locations indicated on the drawings, provide Fire Retardant at wood ceiling/wall paneling per specification 06 05 73.

### 2.02 PANELING TRIM HARDWARE

- A. Fry Reglet Corp., aluminum alloy, anodized bronze color. Finish as selected by Architect.
  - 1. "X" molding for outside corners.
  - 2. "F" molding for horizontal and vertical use.
  - 3. "L" molding for horizontal and vertical use.
  - 4. Channel molding for intermittent use.
- B. Configuration as indicated on the drawings.

## 2.02 ACCESSORY MATERIALS

- A. Nails, spikes, staples: Common, except as otherwise indicated, galvanized for exterior usage, high humidity within conditioned spaces, and treated wood; plain finish for other interior locations; size and type to suit application.
- B. Lag Screws: FS FF-B-561
- C. Machine Bolts: ASTM A307
- D. Wood Preservative: Womanizing treatment at least two weeks prior to site delivery.
- E. Display, Adjustable Shelf Standards: Provide Knap & Vogt standards and brackets as indicated on the drawings for glass display shelving. Bronze color finish.
- F. Fire Protection: Fire-Retardant specification in other section.

## 2.03 ADHESIVES

- A. Type II or II adhesive shall be used in compliance with applicable sections of W.I. "Manual of Millwork" to be applied where required and per manufacturer's recommendations.

# PART 3 - EXECUTION

## 3.01 SURFACE CONDITIONS

- A. 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.

## 3.02 WORKMANSHIP

- A. Produce joints which are true, tight, and well nailed with all members assembled in accordance with the Drawings.

## 3.03 SELECTION OF LUMBER

- A. Carefully select all members so that defects will not interfere with proper nailing or making proper connections, and not impair finished appearances where to be exposed.

## 3.04 GENERAL INFORMATION

- A. Manufacture, mill, fabricate, assemble and finish all millwork by skilled mechanics, using approved standard methods of manufacture and workmanship all in compliance with W.I.C. standards, custom grade.
- B. Conceal means of fastening where other than glued joinery is employed. Use fine casing nails, carefully set without tool marks.

### 3.05 INSTALLATION AND GENERAL WORKMANSHIP

- A. All items of this section shall be custom grade as defined in W.I. "Manual of Millwork". Exposed wood/millwork shall be concealed fastened, surfaces to be sanded and free from tool marks or similar blemishes. Hand sand in the building after erection, until all defects are entirely removed. Any material showing machinery, sandpaper or other defacing marks will be rejected. Neatly and accurately scribe in place wherever required, maintaining full width end members. Miter all exterior angles. Cope interior angles of molded parts. All color of adjoining finishes shall be selected to match and harmonize. Provide a neat, tight joint where work of this section adjoins other work.
- B. Installer shall be competent, experienced craftsman to complete the installation of all items specified and detailed in a first class workmanship manner as defined in Section 26 - W.I.
  - 1. Miscellaneous exterior and interior trim per detailed configuration.
  - 2. Walls, ceiling and soffits paneling including panel trim hardware with concealed fasteners to furring and substraights.
  - 3. Miscellaneous trims and millwork, securely concealed anchoring as detailed, scribed and butt joint.
  - 4. Plastic covered casework, laminated plastic countertops with back splashes and wall paneling (Installation to be by Contractors of Sections 12 32 16 and 12 36 23).
    - a. Securely anchor cabinetwork to the walls and floors with oval head screws with grommets at 32-inch max. on center, level, true alignment and scribed to adjoining surface.
    - b. Countertops secured to casework with flat head wood screws at required length and spacing, level, scribed to walls, mitered corners and waterproof caulk not to exceed 1/16" - color to match. Prep for plumbing and electrical items as specified.
    - c. Laminated plastic wall paneling to be secured to wall with flue liquid nail type adhesive, scribe inside corner and self-edge all exposed edges. Caulk as required color to match. Install furnished mop rack and other accessories furnished by others as indicated.
  - 5. Doors and fire assembly shall be installed with a max. clearance of 1/8" at head, jambs, mullions and pair of doors. Installer is not responsible for clearances in excess of said dimensions. All doors to be prepped for finish hardware to be installed by others. Door installer shall seal all cutouts.



### 3.06 CLEANUP

- A. During and upon completion of the work, comply with the General Provisions of the General Conditions and Section 01 74 00.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide and install the finish work of this section as indicated on the drawings as specified herein and as needed for a complete and proper installation.
- B. Related Requirements: General provisions of the Contract Documents include but not necessarily limited to the General Conditions, Supplementary Conditions, and Sections of Division One of this project manual.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled personnel 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.
- B. Unless specifically otherwise accepted by the Architect, provide laminate products of this section from a single manufacturer.
- C. Millwork shall be manufactured in accordance with the standards in the latest edition of the Manual of Millwork of the Woodwork Institute of California in the grade or grades hereinafter specified or shown on the drawings.
- D. Before delivery to the jobsite, the millwork supplier shall issue a WIC Certified Compliance Certificate indicating the millwork products he will furnish for this job, and certifying that they will fully meet all the requirements of the grade or grades specified.
- E. The first page of the shop drawings shall bear the WIC Certified Compliance Label.
- F. Each plastic laminate countertop shall bear the WIC Certified Compliance label.
- G. Following completion of installation issue a WIC Certified Compliance Certificate for Installation.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of the General Conditions and Section 01 33 00.
- B. Submit detailed dimension shop drawings and product data within the specified days following the receipt of Notice to Proceed.
- C. Shop drawings shall bear the WIC Certified Compliance Label on the first page of each set of drawings.
- D. Submit samples of materials for selection of colors and pattern by the Architect.
- E. WIC Bulletin 419R "Recommended Care and Storage of Architectural Millwork."

#### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of Section 01 62 00.
- B. Deliver all material when project construction is ready for installation. The General Contractor shall provide a clean storage area as required by WIC Manual of Millwork, Technical Bulletin 419-R "Recommended Care and Storage of Architectural Millwork."
- C. Any deviation in color, construction, etc., shall be subject to rejection.

#### PART 2 - PRODUCTS

##### 2.01 ACCEPTABLE MANUFACTURERS

- A. The manufacturer shall have a minimum of five projects equal experience in scope equal to this work.
- B. Laminated plastic counter tops and splashes shall comply with the standards set forth herein and Section 06 41 16.

##### 2.02 COUNTERTOPS AND SPLASHES

- A. Laminated plastic countertops and splashes shall be WIC (Custom) Grade.
- B. Molded Epoxy Resin Tops: Molded epoxy resin tops shall be molded from a modified epoxy resin that has been especially compounded and cured to provide the optimum physical and chemical resistance properties required of a heavy-duty laboratory table top. Tops and curbs shall be a uniform mixture throughout their full thickness, and shall not depend upon a surface coating that is readily removed by chemical and/or physical abuse. Tops and curbs shall be non-glaring and black in color. Table tops shall be 1" thick, unless otherwise shown on the drawings, with drip grooves provided on the underside at all exposed edges. Further, all exposed edges except as indicated below, shall be rounded to a 1/4" radius at front top edge and at vertical corners. 4" high curbs at the backs and ends of standard 31", 24" and 18" wide tops shall be 3/4" thick and the juncture between top and curb shall be coved to a 3/4" radius. Curbs on special width tops and around special cutouts shall be the same thickness as the tops, bonded to the surface of the top to form a square joint. Sink cutouts shall be smooth and uniform without saw marks and the top edge shall have a uniform radius of approximately 1/8". The bottom edge of the sink opening shall be finished smooth with the edge broken to prevent sharpness. Corners of sink cutouts shall be radiused not less than 3/4". Where indicated, table tops shall be indented 1/4" to provide a raised rim 5/8" wide around all exposed edges. The front top edge of the raised rim and exposed vertical corners of the top shall be rounded to a 1/8" radius. The juncture between the raised rim and the top surface shall be coved to a 1/4" radius.
  - 1. Provide Molded Epoxy Resin Tops where called for on drawings.

- C. All splashes shall be 6" high from the surface of the deck. Provide end splashes with square butt joints. Tops shall be fully formed, coved splashes, with self- edge or no drip tilt edge at sink counter.
- D. Where countertops require more than one section, the joint shall be tight flush joint with no deviation in color and top thickness.

### PART 3 - EXECUTION

#### 3.01 SURFACE CONDITIONS

- A. 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.

#### 3.02 FABRICATION

- A. Countertops and splashes shall be performed in the same shop with experienced journeymen personnel under the supervision of a thoroughly experienced foreman.
- B. Coordinate work of this section with Plumbing, Mechanical and Electrical work to be integrated within the casework.
- C. Finish any wood casework exposed trim or feature parts as specified. Finish semi-exposed surfaces such as wood drawer parts, etc., not covered by laminated plastic, with stain or match color of liner using one coat sanding sealer and one coat of clear lacquer. Back priming is required where casework occurs with plumbing fixtures only.
- E. Scribing: Comply with the requirements for custom/premium grade filler strips as specified in the Manual of Millwork.
- F. All countertops to have not less than 3/4" radius corners.

#### 3.03 INSTALLATION

- A. Install casework/millwork in accordance with Section 26 of W.I.C. "Manual of Millwork."
  - 1. Field measurements: Take necessary field measurements to assure proper dimensions for the work specified herein.
  - 2. Standards and quality assurance as set forth.
  - 3. Installation per accepted shop drawings, including method of anchor.
  - 4. Installation includes countertop, millwork, and associated relations of this section.
  - 5. Delivery and storage: Strictly adhere to the requirements of Section 26, Technical Bulletin 419R of Manual of Millwork.

- B. Coordinate mounting of steel backing plates and/or wood blocking prior to wall finish application and job site installation. Timing and coordination are critical and shall be the Contractor's responsibility of acceptance.

#### 3.04 EXECUTION

- A. Install in strict accordance with the WIC requirements specified herein as needed for a complete and proper installation.
- B. Upon completion of the work the installer shall furnish a WIC Certified Compliance Certificate for Installation.

#### 3.05 COMPLIANCE

- A. The Owner reserves the right to request and pay for an inspection by a representative of the Woodwork Institute of California to determine that the work of this section has been performed in accordance with the specified standards.
- B. In the event such inspection determines that the work of this section does not comply with the specified requirements, immediately remove the non-complying items and immediately replace them with items complying with the specified requirements, all at no additional cost to the Owner for the cost of the inspections.
- C. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

#### 3.06 CLEAN UP

- A. Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulations of sawdust, cut-ends and debris.
- B. Sweeping.
  - 1. At the end of each working day, and more often if necessary, thoroughly sweep surfaces where refuse from this portion of the work has settled.
  - 2. Remove the refuse to the area on the job site set aside for its storage.
  - 3. Upon completion of this portion of the work, thoroughly broom-clean all surfaces.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Provide the finish work of this section as indicated on the drawings as specified herein and as needed for a complete and proper installation.
- B. Related requirements:
  - 1. General provisions of the Contract Documents affecting this Section include but are not necessarily limited to General Conditions, Supplementary Conditions, and Sections of Division 1 of the Project Manual.
- C. Related Sections:
  - 1. Rough Carpentry
  - 2. Countertops

1.02 QUALITY ASSURANCE

- A. Codes and Standards:
  - 1. Title 24, Part 2, C.C.R. 2016 C.B.C.
  - 2. Woodwork Institute:
    - a. Performance shall comply with Custom grade requirements of W.I. latest editions.
    - b. Furnish W.I. certified compliance certificate prior to deliver certifying that all materials and fabrication thereof fully meet the specified grade requirements of W.I. specification.
    - c. Each elevation of casework shall bear W.I. certified compliance label.
    - d. Furnish, after completion of installation, W.I. certified compliance certificate certifying that the installation fully meets specified grade requirements of W.I. specification.
    - e. Each plastic laminate countertop shall bear the W.I. certified compliance label.
    - f. Qualifications:
      - i.) Contractors' and their personnel engaged in the Work, able to demonstrate successful experience with work of comparable extend complexity and quality to that shown and specified.

- ii.) Fabricator shall be a member/licensee in good standing of the Woodwork Institute

B. Referenes:

1. Standards for work of this Section shall be in conformity with "W.I." latest edition, Standards of Architectural Millwork Industry as adopted by W.I.
  - a. Section 1: Casework Laminate Plastic
  - b. Supplement #1: Casework construction details.
  - c. Supplement #2: Design Series Elevations

1.03 SUBMITTALS

- A. Comply with Pertinent provisions of the General Conditions and Section 01 33 00.
- B. Submit data: within 60 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  1. Proposed subcontractor's qualifications;
  2. Shop drawings with detailed dimensions in compliance with W.I. Section 1, "Basic requirements for Architectural Millwork shop drawings";
  3. Furnish a W.I. certified compliance label on the first page of shop drwaings;
  4. Submit samples of each species of finish wood – size 6" x 6" minimum or as specified in W.I. manual;
  5. Submit samples of plastic laminate for color selection and patterns.
  6. Unless specifically otherwise accepted by the Architect, provide laminate products of this section from a single manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of Section 01 62 00.
- B. Deliver all materials when the project is ready for installation and General Contractor and other application fees.

1.05SEQUENCING AND SCHEDULING

- A. Coordinate all fabrication, delivery and installation with the general contractor and other applicable trades.

## PART 2 - PRODUCTS

### 2.01 CABINET CASEWORK

- A. Casework shall conform to Woodwork Institute Manual of Millwork
  - 1. Custom Grade, standard
  - 2. Laboratory Grade at Science Classrooms
  - 3. Certified Compliance Program
- B. Components:
  - 1. Casework shall be W.I. Construction Style A – Frameless W.I. Construction Type I Custom Grade;
  - 2. Casework numbers on the Plan or Elevation view reference the W.I. Cabinet Design Series, cabinets are to be fabricated to the size indicated, as adjusted to fill the intended area;
  - 3. Exposed plastic laminate shall be selected from manufacturer's standard solid color, wood grain, or special finish colors, self-edged, from Micarta Division of Westinghouse Electric Corporation.
  - 4. Semi-exposed surfaces or interior surfaces of open cabinets or behind glass doors shall match exposed surfaces;
  - 5. Door and drawer front style shall be flush overlay, and match W.I. door and drawer edge type self-edge.
  - 6. Adjustable shelves shall be in accordance with W.I. requirements subject to a 30, 40, or 50 pound per square foot uniformly spaced load not to exceed 200 pounds per shelf. Glass shelves shall be 4/16 thickness, plate type glass;
  - 7. Casework shall have exposed toe spaces;
  - 8. Casework hardware shall be the desired type, manufacturer, and finish listed as follows or be at the option of the manufacturer from W.I. most current listings of approved product, except in the case of pre-engineered drawer box systems which shall only be permitted by specific specification and/or acceptance;
  - 9. Fabrication shall comply to First Class Workmanship, as defined by the Woodwork Institute, in their "Manual of Millwork";
  - 10. Cores shall be plywood
    - a. Water resistant core at laboratory casework



11. Adhesive used shall be "rigid set" (urea-resin) or "semi-rigid set" (PVC acetate). Do not use "contact" adhesives.
12. Pre-finishing, shall be in compliance with W.I. Custom Grade Finishing System.

## 2.02 FINISH HARDWARE

- A. Hardware listed herein establishes quality of design required. Equal hardware shall comply with supplement No. 1 of W.I. "Manual of Millwork".
- B. Provide finish hardware for casework included in work of this section and indicated on the drawings.
- C. Where hardware selection not listed yet required to furnish a complete unit, fabricator shall have the option of selecting that required hardware from Knape/Vogt or Grant.
- D. Cabinet hardware shall be installed by the casework fabricator.
- E. Locks shall be furnished for door and drawers, each room to be keyed separately. Provide master and grand master keying. Keys to be turned over to the owner's locksmith.
- F. Hardware
  1. Hinges: Heavy duty wrap-around 1-1/2 inches min. width offset for overlay doors with non-removable pin; flat black. Rocker B-Series, or approved equal.
  2. Pulls: Extruded Aluminum, U-shaped pulls at all accessible casework, CBC 1125B.4, Finish to be selected by Architect.
  3. Catches: Magnetic, for doors with no locks, companion to Rocker B-Series hinges or approved equal.
  4. Drawer slides: Full extensions with no deflection, 1/2 inch slide space, 100 pound load capacity, as listed per Knape/Vogt or Grant, or approved equal.
  5. File drawer/ Wide paper Drawer Slides: Heavy duty, full extension, 3 section slide, 1/2 inch slide space, 200 pound load capacity as listed per Knape/Vogt or Grant, no substitution.
  6. Adjustable shelf Standards: Knape & Vogt No. 255 with No. 256 shelf clips, Grand No. 120 with No. 21 shelf clips, or equal.
  7. Guides for sliding glass doors: As detailed.
  8. Door and Drawer Locks: Corbin, drawer lock No. 0738, door lock No. 0737 for single doors and active leaf of pairs of doors, master keyed to Corbin Master 47T9 to match District standard master key system (no exceptions). Locks to be keyed to match building keying system. Provide 2 keys for each lock.

9. Sliding Glass Cabinet Door Locks: Knappe & Vogt No. 963 (no known equal).
10. Screws: Straight shank double thread particle board screws.
11. Adjustable shelving option: Evenly spaced, cleanly, bored holes at a minimum of 2 inches o.c. with metal shelf rests. Holes shall be bored equally distant from front and back edges of shelves a minimum of 32mm to a maximum of 2 inches.

## PART 3 - EXECUTION

### 3.01 EXAMINATION OF CONDITIONS

- A. Conditions of work place: Sub-surfaces which are to receive materials specified under this Section shall be carefully examined before beginning Work hereunder, and any defects shall be corrected to timely and proper completion of the Work. Work shall not be started until such defects have been corrected. Starting such work shall imply acceptance of conditions as they exist.
  1. Verify adequacy of location backing and support framing;
  2. Verify mechanical, electrical, and building items affecting work of this section are in place and ready.

### 3.02 FABRICATION

- A. Install the approved laminated plastic in strict accordance with the manufacturer's recommendations as approved by the Architect.
- B. Finish and wood casework exposed trim or feature parts as specified. Finish semi-exposed surfaces such as swood drawer parts, etc., not covered by laminated plastic, with stain or match color of liner using one coat sanding sealer and one coat of clear lacquer. Backpriming is required where casework occurs with plumbing fixtures only.
- C. Scribing: Comply with the requirements for custom grade filler strips as specified in the Manual of Millwork.

### 3.03 INSTALLATION

- A. Install the Work in strict accordance with W.I. requirements, shop drawings and accepted by the Architect, anchoring all units firmly in position, square, plumb, straight and true.
  1. Install all work in conformance with W.I. Custom Grade.
  2. All work abutting other components shall be properly scribed.
  3. All mechanical fasteners at exposed and semi-exposed surfaces shall be countersunk.

4. Method of attachment, including the type, size, frequency, and/or spacing of anchoring devices and fasteners shall be indicated on drawings.

- B. Disabled Person's Access: Where sink units occur or where indicated, delete the cabinet bottom shelf and toe board to allow wheelchair access to the dimensions indicated on the drawings. Comply with Title 24 and ADA requirements.

### 3.04 ADJUSTMENT

- A. The Owner reserves the right to request and pay for an inspection by a representative of the Woodwork Institute to determine that the work of this section has been performed in accordance with the specified standards.
- B. In the event such inspection determines that the work of this section does not comply with the specified requirements, immediately remove the non-complying items and immediately replace them with items complying with the specified requirements, all at no additional cost to the owner for the cost of the inspections.
- C. Provide other materials, not specifically described but required for a complete and proper installation as selected by Contractor subject to the approval of the Architect.

### 3.05 CLEANING

- A. Upon completion of the installation, remove and clean off markings, and the area of which the work occurred shall be broom clean and remove debris from the site.
- B. Comply with pertinent provisions of General Conditions and following sections of Division 1:

1. Section 01 74 00

END OF SECTION

Division 1 requirements are a part of this section.

#### PART 1 - GENERAL

##### 1.01 WORK SPECIFIED IN THIS SECTION

- A. Provide waterproofing membrane systems for below-grade vertical and horizontal applications, around pits, and beneath finish flooring systems over occupied or to be occupied areas.

##### 1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Dampproofing
- B. Roofing
- C. Traffic Membranes

##### 1.03 GUARANTEE

- A. Provide two year unconditional guarantee against defects of materials and workmanship which allows water or moisture into areas of the structure which were to be protected by this membrane. Pay for costs of repairing or replacing the defective membrane, as well as all costs of exposing and recovering membrane, and consequential damages to persons and property resultant of defective materials or workmanship.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS

- A. Horizontal Cleavage Membrane: Provide Nervastral, or other approved (only where indicated on plans).
- B. Other Horizontal Locations: Provide a fluid applied, self-leveling, polyurethane system such as HLM 2000 manufactured by Sonneborn, Vulkem 201L manufactured by Mameco, or Perma-Gard manufactured by Neogard (only where indicated on plans).
- C. Vertical Below Grade: Provide W.R. Grace Biththene, Multi-Chemical Multi-Thane 3000, or other approved. Include 1/2 inch thick fiberboard or polystyrene protection course.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install all systems using waterproofing installers. Roofing trades will not be acceptable for this work.
- B. Install systems in strict accordance with manufacturer's specifications. Obtain manufacturer's approval of substrate conditions prior to installing materials.
- C. Provide reinforcing strips, and backer rods necessary for joints and cracks.
- D. Once systems (except cleavage membrane system) are installed, water test applications. Perform in such a way that watertight integrity is fully demonstrated. Allow architect and Owner to witness this test. Correct defects, then re-test. Continue this procedure until no leaks exist.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide the finish work of this section where indicated on the drawings and as specified herein, and as needed for a proper and complete installation.
- B. Related Requirements: General Provisions of the Contract Documents to be included but not necessarily limited to General Conditions, Supplementary Conditions, and Sections of Division One of this Project Manual.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled personnel 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.
- B. Unless specifically otherwise accepted by the Architect, provide all products of this section from a single manufacturer.

1.03 CODES AND STANDARDS

- A. Title 24, Part 2, C.C.R., 2016 California Building Code.
- B. Federal Specifications HH-I-521E.
- C. ASTM C665 and E84.
- D. Materials shall comply with the Collaborative for High Performance Schools (CHPS) Material Specifications Section 1350 requirements for chemical emissions requirements.

1.04 SUBMITTALS

- A. Comply with pertinent provisions of the General Conditions and Section 01 33 00.
- B. Product data: Within the specified days following the receipt of the Owner's Notice to Proceed, submit:
  - 1. Materials list of items proposed to be used for the work of this section.
  - 2. Manufacturer's product data and specifications.
  - 3. Manufacturer's recommended installation procedures, when accepted by the Architect, will become the basis for accepting or rejecting installation of the work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with the pertinent provisions of Section 01 52 00.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Products by CertainTeed Corp, Johns Manville, Knauf Insulation and Owens Corning shall be accepted.

2.02 MATERIALS

- A. Provide mineral wool or glass fiber batts, foil-faced, value, flanged, in thicknesses necessary to meet rated below, expressed as average in and out value:
  - 1. Horizontal R38 value.
  - 2. Vertical R21 value, high density
- B. Flame spread rating: 25 or less in accordance with ASTM E84.
- C. Smoke density not to exceed 450.

Note: Specified R values are for materials only and are not to include installation values. Regardless of finish material, all insulation shall have a flame spread rating of 25 or less.

2.03 ACOUSTICAL INSULATION

- A. Provide mineral wool or fiberglass batts, minimum of 3 inches thick, but thickness required to achieve STC rating of 50 or more, and an IIC rating of 50, or 45 if field tested.
- B. Flame spread rating: 25 or less in accordance with ASTM E84. Smoke contribution of 20 max.
- C. Acoustical insulation to be installed at all interior walls of classrooms, toilet rooms, offices and workrooms.

2.04 FIRE SAFING

- A. Provide USG Thermafiber Fire Safing Insulation, or other approved, where fire safing material is shown or required.

2.05 ACOUSTICAL ISOLATORS

- A. Provide isolating and acoustical clamps and sleeves manufactured by Specialty Products Company, or other approved, as approved by local codes.

## 2.06 ACCESSORIES

- A. Sag wires: Provide 18 gage galvanized sag wires at 16" on center.
- B. Impaling and stick pins, including washers, are to be provided as recommended by insulation manufacturer.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Continuously thermally insulate all exterior areas adjacent and contiguous to conditioned / heated spaces, except where shown otherwise on drawings.
- B. Install insulation where shown and as required. Ensure secure attachment so that insulation will not sag over time. Friction fitting is not sufficient. Mechanically attach all insulation. Double-sided tape attachment is not acceptable.
  - 1. Install foil and paper facing on warmer side of area being insulated.
  - 2. Where insulated walls are being left unfinished, install sag wires to support insulation.
  - 3. Where insulation is being installed using impaling pins, ensure that washers are installed over pins after insulation is in place. Space pins as necessary to provide insulation installation which will not sag over time, and as recommended in writing by insulation manufacturer.
- C. Ensure the continuous insulation of the building envelope. Tape all joints, both ends and sides.
- D. Provide two layers of insulation lapping openings by 14 inches or more where intended to be of sound resistive construction at locations such as phone outlets, electrical, mechanical or plumbing penetrations.
- E. Comply with State noise insulation standards.

END OF SECTION



section 07 26 00  
concrete vapor control

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes vapor control system for the following surfaces:
  - 1. New horizontal concrete surfaces scheduled to receive cement-based underlayment, resilient, epoxy, rubber, flooring, carpet, and carpet tile.

1.2 SYSTEM DESCRIPTION

- A. Application of a liquid applied, film forming, two-coat polymer based control system to suppress moisture vapor, alkalinity, relative humidity and concrete salts for the sustainability of subsequent flooring materials. Installation shall prepare surfaces for a flooring installation capable of lasting a minimum of fifteen (15) years.
  - 1. Application shall replace traditional curing and sealing materials.
  - 2. Re-pair control system where testing indicates excessive moisture results.

1.3 SUBMITTALS

- A. Product Data: Physical control system properties.
- B. Certification: Approved applicators certificates.
- C. ASTM Testing: Independent laboratory testing to support specified ASTM performance.
- D. Warranty Certificate: Manufactures standard warranty certificate as specified.
- E. Insurance Certificate: Product liability insurance certificate as specified.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials to the project site in manufacturer's original, unopened containers with seals unbroken and labels indicating brand names, colors, patterns, and quality designations legible and intact.
- B. Do not open containers or remove labels until materials have been inspected and accepted.

1.5 PROJECT CONDITIONS

- A. Environmental Conditions: Install system treatments when concrete surface temperatures exceed 60°F and rain is not expected during scope.

## 1.6 EXTENDED WARRANTY

- A. Performance Warranty: Application of preventative system shall yield a water vapor emission rate of not more than 2.5 ( $\pm 0.50$ ) per ASTM F 1869 and an alkaline value of less than 9.0pH. In the event flooring systems are installed without the use of the corrective system, warranty shall extend the finished flooring materials for a period of fifteen (15) years. Warranty to include repair or replacement of flooring damaged by moisture vapor emission rates above specified rates at no cost to Owner.
  - 1. Issuance of warranty shall not remove 2.5 ( $\pm 0.50$ ) performance requirement.
- B. Flooring Warranty: Product warranty shall the sustainability of flooring products, adhesion and moisture resistance. In the event flooring products are damaged during a fifteen (15) year period by substrate by water vapor emission rates exceeding 2.5 ( $\pm 0.50$ ) and alkaline value greater than 9.0pH, manufacture and installer shall include replacement of flooring materials, adhesives, water vapor emission and alkalinity control systems, and labor costs for removal and replacement of those products.
  - 1. Warranty shall not exclude concrete cracking.
- C. Manufacture shall maintain product liability insurance in the amount of not less than 6 million per occurrence prior and during warranty period.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Products: The design for water vapor emission and alkalinity control systems is based on a two-coat polymer-resin-based (non-silicate) product of Synthetics Intl [www.SyntheticsIntl.com](http://www.SyntheticsIntl.com). Subject to compliance with requirements, provide the named products or a comparable product by one of the following:
  - 1. Diamond Stone Products, Inc.
  - 2. Accepted equal.

### 2.2 CONCRETE VAPOR CONTROL SYSTEM

- A. Physical Properties:
  - 1. Product Color: Clear
  - 2. Application: Two (2) coat minimum
  - 3. Film Forming: Polymer sheen
  - 4. Dry to Touch: 10 minutes
  - 5. Foot Traffic: 1 hour
  - 6. Compatibility: Adhesive applied flooring
  - 7. Film Thickness: 6 mill total
  - 8. Solid Content: 36 to 40 percent
  - 9. Spread Rate: 200 square feet total
  - 10. Crack Control: Crack bridging
  - 11. Chemistry: Single or two-component polymer (non-silicate)
  - 12. VOC Content: 50 grams/liter per EPA method 24
  - 13. Environmental: Solvent free, non-corrosive

14. Vapor Reduction: 40 -75% per ASTM E 96
15. Alkali Resistance: 14pH per ASTM D 1308
16. Concrete Adhesion: 300 – 500psi per ASTM D 4541
17. Moisture Result: 10 pounds reduced to 2.5 lbs. ( $\pm 0.50$ ) per ASTM F 1869
18. Relative Humidity: 85% suppression per ASTM F 2170
19. Alkalinity Control: 14pH per ASTM F 710
20. Water Retention: 0.40 kg/m<sup>2</sup> per ASTM C 156

## PART 3 - EXECUTION

### 3.1 EXAMINATION

#### A. New Concrete:

1. Concrete water to cement ratios of less than 0.45.
2. Sub slab vapor barrier meets ASTM E 1745 Class A, installed per ASTM E 1643.
3. Surface clean and free of contamination for a warranted system.
4. Schedule system application as soon as final finishing operations are complete and hardened sufficiently to sustain foot traffic without damage.

### 3.2 APPLICATION

1. Apply by lint free nap roller at a rate of 300 square feet per gallon and allow to cure.
2. Re-apply product at a rate of 300 square feet per gallon for improved crack resistance, moisture vapor reduction and film thickness.
3. Allow surfaces to dry for a minimum of 12 hours for foot traffic and 24 hours for flooring compatibility.

### 3.3 FIELD QUALITY CONTROL

1. Perform moisture testing directly to control system surface at a rate of one (1) test for each 1,000 square feet of finished floor covering per ASTM F 1869.
2. Re-apply control system in areas where concrete testing exceeds flooring tolerances.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fires topping systems, products, materials and accessories.
- B. Fire stopping sealants.
- C. Safing insulation.
- D. Penetration seals systems.
- E. Fire stopping at intersections of fire-rated partitions and horizontal assemblies.

1.2 REFERENCES

- A. ASTM C719 - Adhesion and cohesion of elastomeric joint sealants under cyclic movement (hockman cycle).
- B. ASTM C920 - elastomeric joint sealers.
- C. ASTM E84 - Surface burning characteristics of building materials.
- D. ASTM E814 - Fire tests of through-penetration fire stops.
- E. UL Fire Resistance Directory, 2000 edition.
- F. UL 1479 - Fire Tests of through penetration fire stops.
- G. Chapter 7, California Building Code, 2016 edition.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data on product characteristics, performance and limitation criteria.
- C. Manufacturer's installation instructions: Indicate preparation and installation instructions.
- D. Provide certification that product meets ASTM E814 and UL 1470 - Fire Classification Tests.

#### 1.4 QUALIFICATIONS

- A. Applicator: company specializing in performing the work of this Section with minimum three (3) years experience.

#### 1.5 REGULATORY REQUIREMENTS

- A. Conform to Chapter 7 of the California Building Code, 2007 edition for fire resistance standards and requirements for penetrations in walls, partitions, floor-ceilings and roof-ceilings.
- B. Provide UL approval numbers for all fire stopping materials, devices and systems.
- C. Maintain one (1) copy of UL fire resistance directory, 2000, edition, on jobsite at all times.
- D. Fire stopping materials shall conform to ASTM E814 and UL 1479.
- E. Fire stopping sealants shall conform to ASTM C719 and ASTM C920.

#### 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when temperature of substrate material and ambient air is below manufacturer's minimum recommendations.
- B. Maintain this minimum temperature before, during and for three (3) days after installation of materials.
- C. Provide ventilation in areas to receive solvent cured materials.

#### 1.7 SEQUENCING

- A. Sequence work to permit fire stopping materials to be installed during or after adjacent and surrounding work is complete.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURER

- A. Manufacturers, products and systems as listed in the 2000, UL Fire Resistance Directory, are approved for use under this Section:
  - 1. Through-Penetration Fire stop Devices (XHCR), Factory-Built Systems: Any of (15) manufacturers listed therein.
  - 2. Through-Penetration Fire stop Systems, (XHEZ) Field-Erected Type: Any of 573 approved systems listed therein.
  - 3. Fill, void, cavity materials (XHHW), installed at jobsite: Any of 41 manufacturers listed therein.

4. Fire stop devices (XHJI), factory built systems: any of 14 manufacturers listed therein.
  5. Forming materials (XHKU) jobsite applied: Any of four (4) manufacturers listed therein.
  6. Through-Penetrating products (XHLY) cable, conduit, pipe and tubing: Any of four (4) manufacturers listed therein.
- B. Manufacturers of systems or devices not listed in the 2000 Directory, but which can supply certification of UL approval since the 2000 publication date are similarly approved for use under this Section.
  - C. Materials and devised utilized in the above referenced systems shall be used only in those systems in which they were tested. Substitutions are not permitted.
  - D. Primers: Recommended by the approved fire stopping manufacturer for specific substrate surfaces.

## 2.2 FIRESTOPPING AT ELECTRICAL BOXES AND UTILITY OUTLETS

- A. Utility penetrations in walls, ceilings or floors requiring protected openings shall be fire stopped and sealed with an approved material securely installed, capable of maintaining its integrity when subjected to test temperatures prescribed in ASTM E814.
- B. Steel electrical outlet boxes on opposite sides of walls requiring protected openings shall be separated by a horizontal distance of 24 inches.
- C. Steel electrical outlet boxes which occur in combination with outlet boxes of an size such that the aggregate area of unprotected outlet boxes exceeds 100 square inches in any 100 square feet of wall are shall be protected by an approved material or detail to decrease the aggregate are of unprotected utility boxes to less than 100 square inches in any 100 square feet of wall.
- D. Steel electrical outlet boxes which exceed 16 square inches in area shall be protected by an approved fire stop material.
  1. Fire stoppng material: MPP-1 MOLDABLE PUTTY PADS, manufactured by 3M Contractor Products, Minneapolis, MN. 3M Test Report No 1167 dated August 21, 1987, FSP FIRESTOP PUTTY PADS, manufactured by Hevi-Duty Nelson Products, Tulsa, OK., FLAMESAFE FSP 1077 Fire stop Pads, manufactured by International Protective Coatings, Cor., Ocean, NJ., or equal.
- E. Utility and electrical outlets or boxes shall be securely fastened to the stud or framing of the wall, or ceiling assembly. The opening in the gypsum board facing shall be cut so that the clearance between the box and the gypsum board does not exceed 1/8 inch.

1. In smoke walls the 1/8 inch clearance shall be filled with an approved fire-rated sealant.

## 2.3 SAFING INSULATION MATERIAL

- A. When approved by the Governing Fire Authority for use as a fire stop material, safing insulation shall conform to the following minimums:
  1. Flame spread 15, smoke density 0, in accordance with ASTM E84.
  2. Density: 3-1/2 to 4 lbs per CF.
- B. Approved Products:
  1. KAOWOOD FIREMASTER BULK, FIREMASTER BOARD and FIREMASTER BATTS, manufactured by Therman Ceramics, Inc., August, GA.
  2. THERMAFIBER Mineral Fiber Safing Batts unfaced, manufactured by USG Interiors, Inc., Chicago, IL.
  3. Any safing insulation listed in UL Fire Resistance Directory, Section (BKNV) conforming to the above minimum fire-resistive properties. Products not conforming thereto will not be approved.

## 2.4 FIRE-RATED SEALANTS

- A. Approved Products:
  1. CP-25 S/L self-leveling and CP-25 N/S non-sag, by 3M co., Minneapolis, MN.
  2. PR-855, two-component silicone foam by Products Research and Chemical Corporation, Glendale, CA.
  3. RTV FOAM PENETRATION SEAL AND FIRESTOP, two-component liquid, and FIRESTOP SEALANT, one-component silicone elastomer, by DOW Corning Corporation, Midland, MI.
  4. METACAULT 900 series inorganic for interior use only, 800 series silicone for exterior and interiors, 525 series ceramic for cable trays, by Metalines, Inc., Oklahoma City, OK.
  5. FLAMESAFE, FS and FS 900 series, water-based, by international Protective Coatings Corporation, Ocean, NJ.
  6. BIOTHERM 100 non-sag, BIOTHERM 200 self-levelling, one-component silicone, by Bio Fireshield, Concord, MA.
  7. Any fire rated sealant listed in UL Fire Resistance Directory.

## 2.5 FIRE RATED SEALANTS AT DECK FLUTE SAFING INSULATION

- A. CP-25 WB, by 3M Co., Minneapolis, MN.
- B. CS-240, by Hilti Corp., Tulsa, OK.
- C. ALBI-CLAD 161C, by Albi Manufacturing, East Berlin, CN.
- D. Substitutions not permitted.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify site conditions.
- B. Verify that openings are ready to receive the Work of this Section.

### 3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material or other matter which may effect bond of fire stopping material.
- B. Remove incompatible materials which affect bond.
- C. Install backing materials to arrest liquid material leakage.

### 3.3 APPLICATION

- A. Apply primer, fire stop sealant or other fire stop materials in accordance with manufacturers recommendations and as approved by regulatory agencies, listed herein.
- B. Apply fire stopping material in sufficient thickness or configuration to achieve designated fire rating.
- C. Install fire stopping material in locations where the designated fire rating must be maintained, including, but not limited to the following:
  - 1. Voids or annular openings around sleeves, piping, ductwork or electrical/communications conduits which penetrate fire rated walls, partitions, floors, ceilings or assemblies.
  - 2. Intersections of fire-rated vertical and horizontal assemblies.
- D. Remove dam material after fire stopping material has cured.

### 3.4 FIRE RATED PARTITIONS

- A. Fire rated or smoke rated partitions shall be fire stopped with an approved fire stop sealant as listed in UL Fire Resistance Directory and as specified herein.



Apply minimum 3/8 inch bead at intersection of finish material and adjacent surface, both sides, entire perimeter.

- B. Intersections at fire rated or smoke rated partitions and steel deck type floor-ceilings or roof-ceiling assemblies may be fire stopped as follows:
1. Tightly fill voids between deep-leg track and metal deck with safing insulation as specified herein.
  2. Install 16 or 18 gage angle clips, covering minimum 3/4 flute depth and 1/2 flute width, both sides, to contain safing insulation firmly in place.
  3. Install minimum, 5/8 inch bead of fire rated sealant around full perimeter of safing insulating plug, both sides.
  4. Install 4 inch wide section of 5/8 inch fire rated gypsum board adjacent to top edge of gypsum board wall covering. Fasten with two screws at each stud flange. Use type S-12 at 16 gage studs, type 3 at 20 gage studs, with minimum 3/8 inch penetration into stud. Do not penetrate deep-leg track.
  5. Fill 1/2 inch deflection space with approved fire rated sealant as specified herein, full depth, both sides.

### 3.5 CLEANING

- A. Clean adjacent surfaces of fire stopping materials.

### 3.6 PROTECTION OF FINISHED WORK

- A. Protect finished work.
- B. Protect adjacent surfaces from damage by material installation.

### 3.7 INSPECTION

- A. Notify Inspector before work is covered. Approval of Inspector shall be received before any work is concealed in a manner which will make inspection difficult. Work which has been covered prior to inspection and approval shall be uncovered, reinspected and recovered.

END OF SECTION

Division 1 requirements are a part of this section.

PART 1 - GENERAL

1.01 WORK SPECIFIED IN THIS SECTION

- A. Sealants and backing, primers and bond breakers for
  - 1. Joints between metal and cementitious building elements.
  - 2. Joints between cementitious elements.
  - 3. Expansion and control joints.
  - 4. Cross joints in copings and projecting work.
  - 5. Sills, jambs and heads of windows, doors, louvers and similar openings where they abutt dissimilar materials.
  - 6. Horizontal joints.
  - 7. Hidden joints expected to undergo minimal movement.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Glass and glazing and appurtenant sealant systems.
- B. Aluminum entrances and windows.
- C. Concrete flatwork.
- D. Roofing and sheet metal.

1.03 CODES AND STANDARDS

- A. Provide an installation in strict compliance with Title 24 requirements.

1.04 SUBMITTALS

- A. Submit manufacturer's printed literature and installation instructions on specified materials for review.
- B. Submit manufacturer's standard colors of materials for selection.
- C. Submit standard size sample of back-up material, primer and bond breaker proposed for each system.

## 1.05 QUALITY ASSURANCE

- A. Proper caulking and proper installation of sealants requires that installers be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.
- B. For caulking and installation of sealants throughout project, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown or required, and the installation requirements called for in these specifications.
- C. Coordinate this work with work of other sections to ensure proper installations.
- D. Provide written certification that materials in contact with the sealants and appurtenant components, such as gaskets, spacers, setting blocks, concrete curing compounds, aluminum finishes, etc., are compatible with the sealants after 21 days exposure to ultra violet 2000 - 4000 (micro-watt radiation).
- E. Provide adhesion test data to production samples of metal and glass/spandrels, tested in accordance with ASTM C794.

## 1.06 GUARANTEES AND WARRANTIES

- A. Provide two year guarantee against defects in materials and workmanship of materials and installation. Include replacement or repairs as may be required by Owner.

## PART 2 - PRODUCTS

### 2.01 SEALANTS

- A. Horizontal non-traffic bearing surfaces: Provide acrylic or terpolymer acrylic base, chemical curing, self-leveling type sealants, non-sagging, uniform, homogeneous and free from lumps, capable of being continuously immersed in water, withstand movement up to 12.5 percent of joint width, and satisfactorily gunnable at 70 degrees F., non-staining and non-bleeding, in colors to be selected by Architect.
  - 1. Acceptable product is Mono manufactured by Tremco, and one part Acrylic Sealant manufactured by DAP.
- B. Horizontal traffic-bearing joints: Provide multi-component, self-leveling polyurethane joint sealant meeting ASTM C920 and Federal Specifications TT-S-00227E, Type 1, Class A, capable of movement to plus or minus 25 percent.
  - 1. Acceptable product is THC-900 as manufactured by Tremco, and Vulkem 245 as manufactured by Mameco.

- C. Vertical surfaces: Provide three part epoxidized polyurethane terpolymer sealant, non-sagging, gun grade, meeting Federal Specifications TT-S-00227E, Class A, Type II, and ASTM C920, Type M, Grade NS, Class 25, Use NT, M, A and O.
  - 1. Acceptable product is Dymeric as manufactured by Tremco, and Vulkem 227 as manufactured by Mameco.
- D. Hidden, paintable, or low movement interior joints: Provide materials in compliance with Federal Specifications TT-S-001657, Type I, Butyl type, able to withstand joint movement to maximum 5 percent.
  - 1. Acceptable product is Butyl as manufactured by Tremco.
- E. Acoustical sealants: Where required, provide acoustical sealants manufactured by Tremco or other approved; highly resilient, permanently flexible, and shrink and stain resistant.

## 2.02 ACCESSORIES

- A. Primers: Where necessary, provide primers compatible with not only sealant, but substrate and finish on which to be applied. Primers are to be non-staining type and must have been specifically tested for durability on the surfaces to be sealed, and are specifically recommended for this installation by their manufacturer.
- B. Back-up Materials: Provide one of the following, as recommended for the particular joint construction and sealant type:
  - 1. Closed cell resilient urethane or polyvinyl-chloride foam.
  - 2. Closed cell polyethylene foam.
  - 3. Closed cell sponge of vinyl or rubber.
  - 4. Polychloroprene tubes or beads.
  - 5. Polyisobutylene extrusions.
  - 6. Oilless dry jute.
  - 7. Preformed support strips for tile control joints and expansion joints - polyisobutylene or polychloroprene rubber.
- C. Bond breaker: Use only one of the following as best suited for the specific application and as recommended by the manufacturer of the sealant to be used.
  - 1. Polyethylene tape, pressure-sensitive adhesive, with the adhesive required only to hold tape to the construction materials shown.
  - 2. Aluminum foil conforming to MIL-SPEC-Mil-A-148E.
  - 3. Wax paper conforming to Federal Specifications UU-P-270.

- D. Masking tape: For masking around joints, provide masking tape conforming to Federal Specifications UU-T-106c.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Joints and surfaces which are to be caulked or sealed shall be clean, dry and free of dust, loose mortar and other foreign materials.
- B. Clean ferrous metals of all rust, mill scale and coatings by wire brush, grinding or sandblasting. Remove oil, grease and/or temporary protective coatings with high performance cleaners, as approved by sealant manufacturer, such as Tremco No. 200 Cleaner.
- C. Joint dimensions for sealant should be reviewed and installed in accordance with sealant manufacturer's printed instructions. In no case should the sealant application be less than 1/4 inch wide, and 1/4 inch deep, except in specific metal-to-metal curtain wall applications, and then as recommended by the sealant manufacturer.
- D. Pre-cast, poured-in-place, or masonry joint surfaces shall be wire brushed, then air-blown clean. The joint interface must be free of form release agents of chemical retarders which may interfere with sealant adhesion and performance.
- E. Sealants shall not be applied to masonry joints where a water repellent or masonry preservative has been applied prior to caulking, when called for.
- F. Do not caulk joints until they are in compliance with requirements of the approved manufacturer of the materials, the details as shown on the drawings, and the specific requirements of other sections of the specification.

### 3.02 INSTALLATION

- A. Apply and install sealant where shown on drawings, or if not shown on drawings, apply and install sealant materials wherever expansion and contraction occurs between materials and products which could lead to infiltration of moisture, water, light, or air blown particles into building; and within building where changes of materials in same or different planes could allow moisture, water, air, or light to penetrate.
- B. Provide acoustical sealants on, around and between building construction members such as framing, panel boxes, cutouts for penetrations of other materials or equipment, etc., where walls and floors are designated to be sound attenuated or acoustically treated.
- C. Install joint backing with a blunt instrument so as not to puncture the surface skin. Size of joint backing should be determined by taking the joint width and adding 25% to assure proper compression of backer rod.

- D. Apply sealant with a caulking gun, using proper nozzles. Use sufficient pressure to properly fill the joints with sealant to the back-up material.
- E. After joints have been completely filled, they shall be neatly tooled to eliminate air pockets or voids, and to provide a smooth, neat appearing finish in intimate contact with interfaces. After tooling, surface of sealant shall be free of ridges, wrinkles, sags, air pockets and embedded impurities.
- F. Immediately clean adjacent materials which have been soiled; leave work in a neat, clean condition.
- G. Major authorities recommend a 40 degree F. minimum application temperature for joint sealant installations because of the possibility of moisture and/or frost contamination on sealing surfaces. However, it is recognized that applications must be made at lower temperatures. When this is necessary, steps must be taken to assure clean, dry, frost-free surfaces, and must be approved by the general contractor.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide the finish work of this section where scheduled and indicated on the drawings as specified herein and as needed for a complete proper installation.
- B. Related requirements: General provisions of the contract documents, affecting the work of this section: includes but not necessarily limited to the general conditions, supplementary conditions and related section of Division 1 of the project manual.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled personnel 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.
- B. Unless specifically otherwise approved by the Architect, provide all products of this Section from a single manufacturer.

1.03 CODES AND STANDARDS

- A. Title 24, Part 2 C.C.R., 2016 California Building Code.
- B. Uniform Building Standards.
- C. I.C.C. Evaluation Service, Inc.
- D. N.F.P.A. #80 Fire Doors and Windows.

1.04 SUBMITTALS

- A. Comply with the pertinent provision of the General Conditions and Section 01 33 00.
- B. Contractor product submittal following Notice to Proceed.
  - 1. Materials list of items proposed to be provided under this section.
  - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
  - 3. Shop Drawings showing details of each frame type, elevations of door designs, details of openings, and details of construction, installation, and anchorage.

4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedure used on the work.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Unless specified otherwise, provide all products of this section from one manufacturer.
- B. Manufacturer
  1. Provide doors, frame and accessories by Curries by Essex Industries Inc., HMMA a division of NAAMM, Security Metal Products, Republic and/or Steelcraft.
  2. Equal products of other manufacturers as approved by architect in advance prior to bid date.
- C. Door Types
  1. All exterior doors shall be metal: 16-gauge exterior, 18-gauge interior with lock, hinge and closer reinforcement, top closer channel, polystyrene filled. Construction shall be seamless, full flush type , welded, shop primed, top and bottom closures. All frame joints between abutting members welded. Doors shall be fully welded at all joints.
  2. Where required to be fire rated assembly, provide fire rating label attached in an inconspicuous location, complying with N.F.P.A. #80 fire doors and windows.
  3. Construction core as indicated, for fire assemblies of mineral wool core or equivalent material.
  4. Provide inverted filler channel cont. welded to flush out door top. Slope to exterior to drain moisture from door top.
  5. Pre-clean and shop prime each door for job site finish painting.
  6. All exterior doors, ASTM G60 galvanized, clean for job site prime and paint.
  7. Doors to be minimum 3'-0" wide by 8'-0" high. Doors with panic hardware: Minimum width 3'-4" or as otherwise required to meet accessibility requirements.
  8. Provide fire rated doors as indicated on drawings.



D. Finish Hardware

1. Secure templates from the finish hardware supplier and accurately install reinforcing where required for job site installation of finish hardware.
2. Hardware provided on fire-rated doors shall be U.L. listed for the use.

E. Door/Glazing Frames

1. Construct fully welded 16 gauge shop primed frames in the dimensions and types as indicated on drawings.
2. Where required to be fire rated assembly provide fire rating label attached in an inconspicuous location.
3. Exterior door frames (jambs) shall be extended 2" by embed into concrete floor slab.
  - a. All exterior frames, ASTM G60 galvanized, clean for job site prime and paint.
4. Operable window frames shall be hollow aluminum, anodized finish. Acceptable manufacturers:
  - a. EFCO 2700
  - b. Traco TR-2500

F. Accessories

1. Glazing in metal doors and frames shall meet the requirements of Title 24, C.C.R., Part 2, 2007 C.B.C. applicable sections.
2. Provide minimum of three (3) jamb anchors for each side of all frames per conditions indicated on drawings.
3. Minimum 18 gauge steel floor anchors.
4. Glazing stops, channel type with sheet metal screws. Install on interior side of window, with vandal proof screws. Exterior stops shall be integral with the window frame.
5. Hardware reinforcing.
  - a. 10 gauge behind butts.
  - b. 12 gauge for mortised or surface applied hardware.
6. Insect screens shall be mounted on the inside face of all operable windows.

## PART 3 - EXECUTION

### 3.01 SURFACE CONDITIONS

- A. 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.

### 3.02 INSTALLATION

- A. Placing Frames.
  - 1. Where practicable, place frames prior to construction of enclosing walls and ceilings.
  - 2. Set frames accurately into position, plumbed, aligned, and braced securely until permanent anchors are set.
  - 3. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
  - 4. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Provide "Z" fillers at each screw location.
  - 5. When installed in prepared openings in concrete unit masonry or concrete construction, provide grout and sealant between frame and concrete in accordance with drawings.
  - 6. Fire doors and frames shall be installed in accordance with their listing, N.F.P.A. #80, and the manufacturer's instruction.

### 3.03 ADJUST AND CLEAN

- A. Final Adjustments
  - 1. Check and readjust operating finish hardware items in hollow metal work just prior to final inspection.
  - 2. Leave work in complete and proper operating condition.
  - 3. Remove defective work and replace with work complying with the specified requirements.
- B. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touchup of compatible air-drying primer.

END OF SECTION

PART 1 - GENERAL

1.01 WORK SPECIFIED IN THIS SECTION

- A. All exterior and interior glass and glazing, except as otherwise specified.
- B. Glazing clips, channels, compound and glazing beads, unless furnished with frame to be glazed.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Framed mirrors.
- B. Caulks and sealants
- C. Rated Glazing

1.03 CODES AND STANDARDS

- A. FS DD-G-451d - Glass, Plate, Sheet, Figured (Flat, for glazing, mirrors and other uses).
- B. FS TT-S-230A - Sealing Compound, Synthetic Rubber Base, Single Component, Chemical Curing for Caulking, Sealing and Glazing in Building Construction.
- C. NAAMM #SS-IB-68 - Nonskinning Resilient Preformed Compounds - Tapes, Ribbons, Beads with Release Paper
- D. ANSI Z97.1.
- E. FGMA - Flat Glass Marketing Association
- F. 16 CFR 1201
- G. Title 24, Part 2 C.C.R. 2016 C.B.C., Chapter 24.
- H. NFPA 80.
- I. ASTM Standards C1048 and C1036.

1.04 GUARANTEE

- A. In addition to guarantee specified in "General Conditions" furnish written guarantee covering all work of this section for 5 years from date of substantial completion. Under the terms of this guarantee, all failures shall be repaired or replaced to satisfaction of the Architect and Owner without additional cost to the Owner. Under the guarantee, all failures from any cause except vandalism and malicious mischief shall be repaired.

## 1.05 SUBMITTALS

- A. Submit manufacturer's standard size samples of glass units to be used for review by Owner and Architect.
- B. Submit manufacturer's literature and pertinent technical data on the products to be installed.
- C. Prepare and submit a schedule of glass and glazing components.
  - 1. Schedule tapes, gaskets, separators and related items including the designation of areas and specific locations where materials and products are to be used, special instructions on their use and installation, and show scheduled items on shop drawings.
  - 2. Provide detailed instructions for the installation and reglazing of glass units. Include with instructions and explanatory details, the sequence of installation, method of installation for all materials and products including the glass, glazing gaskets, setting blocks, jamb blocks, etc., location of specific items such as the setting blocks and jamb blocks and any special instructions as may be required.
- D. Certifications: Certify that the following materials and products and processes conform to these Contract Documents and submit in accordance with other sections of these specifications:
  - 1. Sealants
  - 2. Neoprene, nylon, etc.
  - 3. Glass
  - 4. Compatibility of materials, finishes, methods of application.

## 1.06 QUALITY ASSURANCE

- A. Glass Performance:
  - 1. The maximum overall size, minimum thickness, and type of glass is to conform to the applicable glass manufacturer's published recommendations for the openings or sizes indicated on the drawings, and the performance requirements specified in these specifications.
  - 2. Ensure that glass and glazing components conform to governing codes and regulations.
  - 3. Design glass to perform to a specified safety factor of 2.5 and sustain at maximum wind loading a statistical glass breakage of no more than eight lites in one thousand.
- B. Be responsible for correct selection of glass including required accommodations for fire access, conditions of thermal stress, venting, wind loading and other factors which can reasonable be inferred from the drawings and location of the project.

## 1.07 PRODUCT HANDLING

- A. Take reasonable precautions necessary to provide complete protection of glass and glazing materials before, during and after installation.
- B. In event of damages or breakage, repair or replace damaged and defective materials and products to the satisfaction of the Owner within 5 calendar days.

## PART 2 - PRODUCTS

### 2.01 GENERAL GLASS REQUIREMENTS

- A. All glass units are to be tongless edged, best quality, sizes and thickness required by drawings or conditions.
- B. Glass and related glass and glazing materials will be verified and coordinated with the performance requirements and be as recommended, in writing, by the applicable glass and gasket manufacturers. The type, size, thickness and design of all glass units, including dimensions, tolerances, glazing pockets, jamb and seismic blocking, glass edge clearance and frame lap, will be verified and documented. NOTE: The selection of the glass will take into special account the performance requirements herein specified.

### 2.02 MATERIALS

- A. Interior Float Glass: Thickness as shown or specified, tempered in doors and adjacent lights, and where shown "Clear Glass" (PPG Industries), or "Clear, Select" (Pilkington).
- B. Exterior Glazing System: Provide two panes of glazing per opening as follows:
  - 1. Exterior Pane: "Makrolon SL" by Sheffield Plastics, Inc. 1/4" thick, single glazed bronze. Shading Coeff .70, SHGC 0.675, 50% Light Transmittance.
  - 2. Interior Pane: 1/4" clear glass with low-e PPG Solarban 60 coating on exterior face. VLT = 0.70, SHGC = 0.38.
- C. Refer to opening details on drawings for installation.

### 2.03 GLAZING MATERIALS

- A. Sealants:
  - 1. Tremco, General Electric, and Dow Corning sealant products are approved where use is documented and in accordance with the use and conditions of this project.
  - 2. Compatibility and sequence of installation for sealants is to be carefully considered in design to ensure that required cure and optimum performance are met.

3. Do not allow sealants selected and used to degrade or fail under design conditions including, thermal movement (expansion and contraction), standing water, ultra-violet exposure, aging, and other adverse time and environmental conditions.
  4. Structural sealants: Provide Tremco, G.E. or Dow Corning approved sealant and primer. Ensure acceptance by manufacturer of product or system of construction into which glass and sealant is being installed.
  5. Color - To be selected by the Architect.
  6. Test sealants in accordance with ASTM C794.
  7. Perform field adhesion tests in accordance with manufacturer's printed recommendations.
- B. Spacers: Provide extruded silicone shims, 60-70 Type A durometer.
- C. Setting Blocks: Provide neoprene 80 to 90 Type A durometer hardness type.
- D. Tape: Provide Tremco 440 tape, or other approved.
- E. Neoprene glazing gaskets and air seals:
1. Provide glazing gaskets which are extruded type with continuous interlocking projection to engage into the metal glass holding member, are designed to be in contact at all times with adjacent, contiguous elements during dynamic loading, building and thermal movements, and provide a continuous watertight seal as required to meet the performance criteria.
  2. Toll-in and back-up gaskets are to be sized in lengths or units to provide for a minimum crowd-in of 1 percent to 2 percent, or as otherwise recommended by manufacturer, to ensure against any pullback at corners.
  3. Roll-in glazing and back-up gaskets for any one lite or glazed opening is to be continuous one piece units with factory fabricated injection molded corners free of all flashing and burrs.
  4. Materials, recommendations and details describing the proposed use, design, and application procedures for glass and glazing materials are to be documented and fully described on shop drawings.
  5. Air seal gaskets are to be continuous, closed-cell (sponge) neoprene gaskets with pressure sensitive adhesive on one side in thickness and shore durometer hardness as required for the specified performance criteria.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Remove lacquer and other coatings from glazing rebates. Thoroughly clean areas to receive glass and glazing materials. The installation shall be in strict accordance with recommendations of window, glass and sealant manufacturers. Glass shall be installed so that no metal-to-glass contact occurs.
- B. Installation shall be in accordance with applicable requirements of the latest edition of the "Glazing Manual" of the Flat Glass Marketing Association. Where vinyl or neoprene glazing beads or channels are used, they shall be in one piece for each edge of glass, with corners neatly mitered and tightly fitted together.
- C. Glass shall be cut to size in the shop. Glass shall have cleancut edges as defined by PPG Industries Technical Service Report No. 104C. Other edges will not be accepted.
- D. Perimeter clearance must be sufficient to avoid point loading and provide for jamb and seismic blocking.

### 3.02 TEMPERED GLASS UNITS

- A. Do not field cut or drill any tempered glass units. Cut to proper size in factory.
- B. Vertical tempering will not be allowed.

### 3.03 PROTECTION

- A. Maintain glass in a reasonably clean condition during construction so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other surfaces.

### 3.04 TESTING

- A. Upon completion of installation of glass and glazing, perform water tests in accordance with industry standards for such tests, and ASTM E331, AAMA FC-1-76, and NAAMM. Repair leaks and retest. Continue with tests and repairs or replacements until such time as entire installation has been tested and certifiably exhibits no water intrusion, thereby instituting five year guarantee against such water intrusion.

### 3.05 CLEANING

- A. Immediately prior to scheduled acceptance of work, remove protective materials and clean all glass members, being careful not to use abrasives or harmful cleaning agents.

END OF SECTION

PART 1 – GENERAL

1.01 Summary of Considerations & District Criteria

- A. The District has established smooth surfaced drywall as the preferred finish in exposed conditions. Note that this finish, combined with the Districts standard of semi-gloss paint at all exposed conditions, will require a high degree of skill on the part of the drywall installers. It also will show inconsistencies in the substrate.
- B. In order to minimize damage potential, the District Standard is to provide backing under drywall at high abuse areas, such as corridors, toilets and locker rooms. Materials for this backing are listed in this Section.
- C. Architect recommends the use of the listed glass fiber faced gypsum sheathing at all exterior surfaces that will not be covered within one week in order to minimize weather deterioration found with typical paper faced products.
- D. The use of cementitious backer units/boards (CBU) for tile instead of a cement "mud bed" is common place. However, such panels often transfer deficiencies in the substrate to the tile surface. See Section 09 30 00 for coordination with leveling bed requirements.

1.02 WORK INCLUDED

- A. Gypsum board.
- B. Joint treatment and surface finishes.
- C. Metal support and furring systems.
- D. Cementitious backer board for ceramic tile.
- E. Exterior gypsum sheathing.
- F. Rated shaftwall assemblies.
- G. Metal suspension system for drywall ceiling assemblies.

PART 2 - PRODUCTS

2.01 GYPSUM BOARD

- A. Manufacturer: USG, Goldbond or equal.
  - 1. Provide the same manufacturer for all like products.



B. Board Type:

1. Non-Rated: USG Regular per ASTM C36.
  - a. Edge: SW Tapered.
  - b. Thickness: 5/8 inch.
2. Fire Rated: USG FireCode Core (Type X) per ASTM C36.
  - a. Edge: SW Tapered.
  - b. Thickness: 5/8 inch.
3. Water Resistant: USG Water Resistant FireCode Core, Type X, per ASTM C 630.
  - a. Edge: Tapered.
  - b. Thickness: 5/8 inch.
4. Exterior Sheathing: USG Gypsum Sheathing FireCode Core, Type X, per ASTM C 79.
  - a. Edge: Square.
  - b. Thickness: 5/8 inch.
5. Shaftwall Board: USG Gypsum Liner Panel, per ASTM C 442.
  - a. Edge: Beveled.
  - b. Thickness: 1 inch.
6. Shaftwall Face Board: USG Gypsum UltraCode Core Panel, per ASTM C 36.
  - a. Edge: Tapered.
  - b. Thickness: 3/4 inch.

2.02 ACCESSORIES

- A. Acoustical Sealant: USG, Non-hardening, non-skinning, conforming to ASTM C 557 and C 919, for use in conjunction with non-rated gypsum board assemblies.
- B. Drywall Joint and Edge Accessories:
  1. Corner Bead: USG Durabead or approved alternate, metal.
  2. Edge Trim: USG Series 200 or approved alternate, metal.
  3. Expansion Joint: USG 093 or approved alternate, metal.
  4. Drywall Reveal: Fry, DRM Series, reveal dimension as shown on drawings.
- C. Joint and Finishing Systems:
  1. Provide systems produced by same manufacturer as boards.

2. Joint Systems: USG Ready Mixed Compounds, complying with ASTM C 475, vinyl based, certified asbestos free.
  3. Finishing System Materials: USG Multi-Purpose or approved alternate, complying with ASTM C 475, non-aggregate, vinyl based, certified asbestos free.
  4. Primer: Manufacturers approved primer, compatible with finishes specified in other Sections.
- D. Fasteners:
1. Gypsum board screws: type and length as required by installation and UL Listing criteria.
  2. Gypsum board nails: type and length as required by installation and UL Listing criteria. Nails not permitted at interior gypsum board applications.
  3. Cementitious Backer Unit screws: corrosion resistant, type and length as required by manufacturer, installation and UL Listing criteria. Nails not permitted.
- E. Adhesive:
1. Manufacturers approved adhesive for attachment to concrete surfaces.
- F. Underlayment Membrane: Fortifiber Moistop or approved equal.

## 2.03 FRAMING COMPONENTS

- A. Metal Furring Components:
1. Resilient Channels: USG, Series RC-1, 1/2 inch depth.
  2. Wall Furring Channels: Provide USG Unimast Metal Furring Channel, 20 gauge, corrosion resistant steel.
- B. Shaftwall Stud Systems:
1. Series: C-H.
  2. Size: As shown on drawings.
  3. Gauge: 20 gauge.
  4. Finish: Galvanized per ASTM A 653.
  5. Accessories: Provide clips, runner and track as required for installation and assembly rating.

## 2.04 CEMENTITIOUS BACKER UNIT (CBU)

- A. Manufacturer: United States Gypsum (USG) or equal.
- B. Series: USG Durock Exterior.
- C. Characteristics:
  - 1. Edge: Square.
  - 2. Thickness: 1/2 inch.
  - 3. Indentation Resistance: 2300 psi, 1 inch disc at 0.02 inch indentation per ASTM D 2394.
  - 4. Water Absorption: 10 percent maximum at 24 hours per ASTM C 473.
  - 5. Flexural Strength: 1000 psi per ASTM C 947.
- D. Fire and Life Safety Criteria:
  - 1. Surface Burning/Smoke contributed: Maximum values of 5/0 per ASTM E 84.
  - 2. Listing: UL Listed as a component in rated wall and floor assemblies per ASTM E 119.

## 2.05 GYPSUM BOARD BACKING

- A. Non-Combustible Construction Assemblies:
  - 1. USG Durock Exterior complying with this Section.
  - 2. James Hardy or equal Hardi Panel mineral fiber panel, 5/8 inch thickness.
- B. Combustible Construction Assemblies:
  - 1. Particleboard, 5/8 inch thick, complying with Section 06 10 00.
  - 2. Plywood sheathing, 1/2 inch thick, complying with Section 06 11 00.
  - 3. USG Durock Exterior complying with this Section.
  - 4. James Hardy or equal Hardi Panel mineral fiber panel, 5/8 inch thickness.

## 2.06 EXTERIOR GYPSUM SHEATHING SUBSTRATE

- A. Manufacturer: Georgia Pacific.
- B. Type: Glass fiber faced gypsum sheathing complying with ASTM C 1177.
- C. Series: Dens-Glas Gold Firestop.

D. Characteristics:

1. Thickness: 5/8 inch.
2. Edge: Square.
3. Fire Resistivity Rating: Type X, non-combustible per ASTM E 136.
4. Approval: ICBO Evaluation Service Report No. 4305.

2.07 OTHER MATERIALS

- A. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 INSTALLATION AND PLACEMENT CONSIDERATIONS

- A. Install gypsum board in accordance with manufacturer's instructions and designated system number for fire rated assemblies.
1. Unless noted otherwise, utilize water resistant type for wall surfaces within four feet of the outermost edge of any plumbing fixture or moisture generating equipment. Extend water resistant gypsum board full height.
  2. Do not use water resistant gypsum board on ceiling applications.
- B. Where gypsum board extends across concrete curbs, install with specified adhesive, consisting of vertical beads placed at 4 inches on center full height. Bond to curb with rollers exerting sufficient pressure to assure full contact and surface alignment with board at framing above.
- C. Cementitious backer unit installation:
1. Install backer board in accordance with manufacturers recommendations, including USG Systems Folder SA-700.
  2. Apply specified underlayment membrane to framing with approved adhesive or tape. Lap membrane 4 inches in shingle fashion at all joints.
  3. Install backer board with joints over supports. Space ends and edges 1/8 inch apart.
  4. Install backer board using screws at maximum 8 inches on center at each support.
  5. Prefill all joints with approved mortar. Tape all joints and level.

- D. Gypsum Board Finish: Comply with descriptions and Finish Levels as specified and in accordance with referenced standard.
1. LEVEL 2 Finish: Gypsum board located above ceiling areas, plenums, and similar surfaces not visible in completed construction including behind vinyl covered tackboard panels:
    - a. Embed tape at all joints and interior angles in joint compound.
    - b. Apply one separate coat of joint compound over all joints, angles, fastener heads, and accessories.
    - c. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
  2. LEVEL 4 Finish: Gypsum board designated to receive vinyl wallcovering.
    - a. Embed tape at all joints and interior angles in joint compound.
    - b. Apply three separate coats of joint compound over all joints, angles, fastener heads, and accessories.
    - c. Surface shall be smooth and free of tool marks and ridges.
  3. LEVEL 5 Finish - Smooth: Gypsum board surfaces receiving eggshell, semi-gloss or gloss paint finish.
    - a. Embed tape at all joints and interior angles in joint compound.
    - b. Apply three separate coats of joint compound over all joints, angles, fastener heads, and accessories.
    - c. Apply thin skim coat of joint compound over entire surface. Sand as necessary. Surface shall be smooth and free of tool marks and ridges.
- E. Comply with the following tolerances for level, plumb and flat. Where substrate framing will not comply with specified tolerances, correct deficiencies as required.
1. Level and Plumb: Plus or minus 1/4 inch in 10 feet, non-cumulative.
  2. Flatness: No gaps exceeding 1/8 inch at any point under a 10 foot straight edge placed on surface in any orientation.

END OF SECTION

PART 1 – GENERAL

1.01 Summary of Considerations & District Criteria

- A. The District has established the listed products for the specific applications as Standards. Given the tremendous range in tile products, there are obviously other solutions possible for additional design applications, such as lobby floors and administrative areas.
- B. The use of cementitious backer units/boards (CBU) for tile requires use of leveling bed requirements as listed.
- C. The District has established use of epoxy grouts as a Standard, for durability and maintenance considerations for student and public areas. Staff areas do not generally have the contact exposure requiring the expense of epoxy grouts.
- D. Architect recommends the use of mortar bed setting methods in order to improve leveling control and compression resistance.

1.02 SECTION INCLUDES

- A. Ceramic tile.
- B. Quarry tile.
- C. Grout, mortar bed and setting materials.
- D. Waterproof underlayment and cleavage membranes.
- E. Sealers.

PART 2 - PRODUCTS

2.01 CERAMIC TILE

- A. Selection indicated is District "standard" & to establish required level of quality, appearance, and performance. The Architect may consider comparable products by alternate manufacturers where listed, and requests for substitutions, under the provisions of Section 01 25 00.
  - 1. All tile, for like applications, shall be the product of a single manufacturer as indicated below.

B. Product Characteristics: Floor tile:

1. Manufacturer: Dal-tile: Contact information: CT Sales office – 1600 South Page Court; Anaheim, California 92806. Phone: 1-714-634-2546
2. Series: Keystones Porcelain Mosaic Ceramics.
3. Size: 2" x 2".
4. Grout Joint: Nominal 1/16", all joints equal, except at expansion joint conditions. Provide minimum 1/8 inch wide joint at all expansion joint conditions.
5. Coefficient of Friction: Minimum 0.60 per ASTM C-1028 shall be accepted as meeting the intent of slip resistance- CBC 1124B.1

C. Product Characteristics: Wall tile:

1. Manufacturer: Dal-tile: Contact information: CT Sales office – 1600 South Page Court; Anaheim, California 92806. Phone: 1-714-634-2546
2. Series: "Festiva".
3. Size: 3" x 6".
4. Grout Joint: Nominal 1/16", all joints equal, except at expansion joint conditions. Provide minimum 1/8 inch wide joint at all expansion joint conditions.
5. Coefficient of Friction: Minimum 0.60 per ASTM C-1028.
6. Installation: Install in a "running bond" pattern.

2.02 QUARRY TILE - FULL PREPARATION KITCHEN APPLICATIONS

A. Manufacturer: Dal Tile,

1. Dal-tile: Contact information: CT Sales office – 1600 South Page Court; Anaheim, California 92806. Phone: 1-714-634-2546;
2. American Olean: Contact information – 1645 South Sinclair Street; Anaheim, CA 92806. Phone: 1-714-385-9980, Fax: 1-714-385-0120;
3. Or approved equal from contractor's submittal.

B. Characteristics:

1. Series: Sure Step, Unglazed Quarry Tile, with cove tile at all base conditions.
2. Color: Q12 Red.
3. Finish: Unglazed, raised slip resistant pattern.

4. Size: Nominal 6 x 6 x 1/2 inch thick, with raised random slip resistant pattern.
5. Grout Joint: Nominal 1/4", all joints equal.
6. Coefficient of Friction: minimum 0.60 per ASTM C1028.

#### 2.03 PORTLAND CEMENT MORTAR

- A. Mortar Bed: Portland cement and sand mixture, complying with specified method and ANSI A108.1B.
- B. Thin-set Application Mortar: Portland cement mortar, with acrylic additive per ANSI A108.5 and A118.4.

#### 2.04 PORTLAND CEMENT BOND COAT

- A. American Olean or equal, Multipurpose Dry-set Mortar per ANSI A108.5 and A118.4.

#### 2.05 GROUT

- A. All grouts shall be produced by same manufacturer
- B. Un-Sanded Grouts: American Olean or equal, with acrylic grout additive per ANSI A118.6. Color as selected by Architect from complete color line, including Designer series.
- C. Epoxy Grouts:
  1. Manufacturer: American Olean or equal.
  2. Series: AO 6000, 100 percent solids, sanded grout, complying with ANSI A118.3, formulated for required joint widths.
  3. Service Temperature Resistance: 350 degrees F.
  4. Color: As selected by Architect from complete standard 16 color line.

#### 2.06 ACCESSORIES

- A. Sealants:
  1. Interior sealants: Unless noted otherwise, provide sealants as manufactured by grout manufacturer.
    - a. Where exposed to pedestrian traffic, provide sealants rated for pedestrian traffic, with minimum Shore A value of 35, as manufactured by grout manufacturer.
    - b. Match adjacent grout color.
  2. Exterior Ceramic Tile Paving Sealants: As specified in Section 07 90 00.



3. Exterior Ceramic Wall Tile Sealants: As specified in Section 07 90 00.
- B. Reinforcing Mesh: 2 x 2 inch square x 16 gauge welded wire mesh.
- C. Cleavage membrane: Provide CTI approved cleavage membrane.
- D. Organic Adhesive: Type 1 organic adhesive, complying with ANSI A136.1 and approved by CTI for application.

#### 2.07 WATERPROOFING AND CRACK ISOLATION MEMBRANES

- A. Thin-set Waterproofing applications: NobleSeal TS, preformed sheet CPE membrane, 30 mil thickness, with facing. Provide preformed corners and all manufacturers recommended accessories.
- B. Thin-set Joint Isolation Membrane: NobleSeal CIS, preformed sheet CPE membrane, 30 mil thickness, with facing. Provide all manufacturers recommended accessories.
- C. Mortar bed waterproofing applications: NobleSeal Chloraloy 240, preformed sheet CPE membrane, 40 mil thickness. Provide preformed corners and all manufacturers recommended accessories.

#### 2.08 THRESHOLDS/TRANSITIONS

- A. Tile/Carpet Edge Protection: Provide Schluter, Schiene-M series, brass, height as required.
- B. Tile/Carpet Edge Transition: Provide Schluter, Reno-MTK series, brass, height as required.
- C. Tile/resilient flooring Transition: Provide Schluter, Reno-MTK series, brass, height as required.

#### 2.09 ACCESSORY TILE

- A. General
  1. All accessory tile shall be in matching size, color, and finish.
  2. Stretcher tile can be the standard size of the manufacturer.
  3. Provide surface bullnose trim at all open edges or ends. Unglazed or cut tile edges unacceptable.
  4. Provide surface bullnose trim at all tile abutting jamb conditions and extending beyond frame.
  5. Provide full curved stretcher tile for all outside corners.

## 2.10 OTHER MATERIALS

- A. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

## PART 3 - EXECUTION

### 3.01 INSTALLATION AND PLACEMENT CONSIDERATIONS

- A. Cleavage Membrane: Unless otherwise shown on drawings, where mortar bed is installed over concrete slab on grade at interior applications, provide specified cleavage membrane.
- B. Joint isolation membrane installation:
  - 1. Install at all cracks in concrete slab substrates, control and expansion joints, and at all transitions between dissimilar materials.
  - 2. Extend each side of crack or joint a minimum of 4 times diagonal tile dimension.
  - 3. Apply using approved latex modified mortar system.
  - 4. At expansion joints, continue sheet material in looped fashion through joint to accommodate anticipated joint movement.
- C. Tile and grout installation:
  - 1. At student and public toilets and all shower/locker rooms, install tile to minimum 8 feet above finish floor at all wall surfaces.
  - 2. Install wall tile at cementitious backer board per TCA Method W244, and per ANSI A108.5.
    - a. Provide Portland cement leveling coat as required to provide surface complying with 1/8 inch in 8 feet tolerance.
  - 3. Install grout at abrasive grit tile using grout bag or grouting machines. Conventional sponge spread technique not acceptable.
  - 4. At all kitchen, student toilets and locker/shower rooms, and public toilets, grout all joints with specified epoxy grout per ANSI A108.10.
  - 5. At all staff toilets and locker/shower rooms, grout all joints with specified non-sanded grout per ANSI A108.10.
- D. Installation of expansion and control joint assemblies.
  - 1. Provide expansion joints complying with TCA Detail EJ171 at the following specified locations and as located and shown on drawings:

- a. At wall tile to paver / floor tile joints.
  - b. At all expansion and control joints in substrate. Where tile joint does not occur directly over substrate joint, provide sealant joint on each side of joint.
  - c. At tile joint at inside vertical corners.
  - d. At interior applications, at approximately 24 feet on center each way in floor and wall tile surfaces. Adjust to 12 feet at toilet tile conditions, and 8 feet for dark tile in sunlight areas.
  - e. At exterior applications, at approximately 12 feet on center each way in floor and wall tile surfaces. Adjust to 8 feet as necessary for dark tile in sunlight areas.
  - f. Where material transitions occur, comply with expansion/control joint criteria.
  - g. At conditions where tile extends through doorways, extend wall cove/floor tile sealant joint across doorway.
  - h. At floor drain/tile edge, column penetrations, tile terminations against frames and other restraining elements.
  - i. At tile terminations against curbs, paving or other restraining elements.
- E. Do not allow traffic on tile for a minimum of 72 hours after installation.
- F. Provide damp cure of all installations per manufacturer's recommendations and per ANSI A108. Do not damp cure latex modified grout systems unless recommended by manufacturer.
- G. Tolerances
- 1. Grout joint alignment with adjacent edge: 1/8" in 10 feet.
  - 2. Row and column alignment: 1/8" in 10 feet deviation.
  - 3. Alignment with adjacent tile: 1/16" +/-.
  - 4. Level, plane and/or vertical: 1/8" in 10 feet deviation.

END OF SECTION

PART 1 – GENERAL

1.01 Summary of Considerations & District Criteria

- A. The District has established the listed products as Standards in order to minimize stocking and maintenance issues. Use of alternate finishes and edge types may be appropriate for specific design applications.
- B. While the District prefers the use of gypsum board ceilings in kitchen areas, the listed ceiling tile product is suitable for most kitchen applications.
- C. Given the number of variations possible, this document does not reflect use of fire rated ceiling systems as part of listed hourly rated assemblies.

1.02 WORK INCLUDED

- A. Suspended metal grid ceiling system.
- B. Acoustical panels.
- C. Acoustical tiles.
- D. Perimeter trim.

PART 2 - PRODUCTS

2.01 CEILING SUSPENSION SYSTEM

- A. Manufacturer: Chicago Metallic, Donn or equal.
- B. Series: 1200 (STAB) Seismic 15/16"
  - 1. Main Runner: 200-01
  - 2. Cross Runners: 1214-01 at 48 inch length, and 1226-01 at 24 inch length.
  - 3. Edge moldings: "L" shaped, 1420-01.
  - 4. Face Dimension: 15/16 inches.
- C. Duty Rating: Heavy Duty per ASTM C635.
- D. Fire Resistance Rating: Non-rated assembly.
- E. Typical Color: White

- F. Room C06 Music Classroom Color: Black
- G. Support/Fastening System: Components of size and type as shown in the drawings or identified in DSA IR M-3 (9/99), as required to rigidly secure acoustic ceiling system with maximum deflection of 1/360.
- H. Compression Strut: Provide vertical compression strut at grid in accordance with DSA IR M-3 and as shown on drawings.

## 2.02 ACOUSTIC PANELS: LAY-IN APPLICATION

- A. Manufacturer: Armstrong or equal.
- B. Series: Medium Fissured
  - 1. Style: Cortega Tile & Lay In; Item 769A., No Pattern
  - 2. Edge: Square edge.
  - 3. Size: 24 x 48 x 5/8 inch.
- C. Fire/Habitability Criteria:
  - 1. Fire Resistance Rating: Class A per ASTM E1264, maximum Flame Spread of 25, maximum smoke contributed of 450, UL Labeled
  - 2. Noise Reduction: NRC range of 0.55.
  - 3. Light Reflectance: LR-1 (Minimum 0.80).
  - 4. Humidity Resistance: No visible sag under conditions not to exceed 90 percent humidity and 104 degrees F, with 10 year warranty coverage.
- C. Finish: Factory applied paint.
- D. Typical Color: White.
- E. Room C06 Music Classroom Color: Tech Black

## 2.03 ACOUSTIC PANELS: LAY-IN SCRUBBABLE APPLICATION

- A. Manufacturer: Armstrong or equal.
- B. Series: ML Fire Guard
  - 1. Style: No. 864, non-perforated, with retention clip 414.
  - 2. Edge: Square.
  - 3. Size: 24 x 48 x 5/8 inch.
  - 4. Weight: 1.0 PSF or greater.

A. Fire/Habitability Criteria:

1. Fire Resistance Rating: Class A per ASTM E1264, maximum Flame Spread of 25, maximum smoke contributed of 450, UL Labeled.
2. Noise Reduction: NRC range of 0.10.
3. Light Reflectance: LR-.80 (Minimum 80%).
4. Labeling: All panels shall have UL Label.
5. Clean Room Application: Suitable for use in Class 100 Clean Rooms per FS 209D.

B. Finish: Factory applied vinyl facing.

C. Color: White.

2.04 ACOUSTIC TILE - ADHESIVE APPLIED:

A. Manufacturer: Armstrong or equal.

B. Series: Minatone

1. Style: Cortega, 745.
2. Edge: K4C4, beveled, for butt installation.
3. Size: 12 x 12 x 5/8 inch.

C. Fire/Habitability Criteria:

1. Fire Resistance Rating: Class A per ASTM E1264, maximum Flame Spread of 25, maximum smoke contributed of 450, UL Labeled.
2. Noise Reduction: NRC range of 0.55.
3. Light Reflectance: LR-1 (Minimum 0.80).

C. Finish: Factory applied paint.

D. Color: White.

E. Accessories:

1. Provide UL listed adhesive, with maximum flame spread value of 10 and maximum smoke contributed value of 10.
2. Provide white perimeter edge trim.

## 2.05 OTHER MATERIALS

1. Provide all other materials, not specifically described but required for complete and proper installation of this work, as selected by the contractor and subject to the approval of the Architect.

## PART 3 – EXECUTION

### 3.01 INSTALLATION AND PLACEMENT CONSIDERATIONS

- A. Install system in accordance with UBC Standard 25-2 as modified by Section 2501A.5, Chapter 25A, Part 2, T-24 CCR, including required vertical compression struts.
- B. Where ducts or other equipment prevent the regular spacing of hangers, install independent framing below ductwork or equipment from which hangers may be attached. Hangers are prohibited from being attached to any non structural building element.
- C. Variation from Flat and Level Surface: 1/8 inch in 10 feet.

END OF SECTION

Division 1 requirements are a part of this section.

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Requirements: General Provisions of the Contract Documents to be included but not necessarily limited to General Conditions, Supplementary Conditions, and Sections of Division One of this Project Manual.

1.02 WORK SPECIFIED IN THIS SECTION

- A. Work Included: Resilient flooring, including base for resilient flooring and carpeting.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Concrete Sub-flooring.
- B. Carpeting.
- C. Ceramic tiles and other floor finishes.

1.04 REFERENCE STANDARDS

- A. Federal Specifications - SS-T-312: Tile, Floor, Rubber, Vinyl.

1.05 SUBMITTALS

- A. Comply with pertinent provisions of the General Conditions and Section 01 33 00.
- B. Product data: Within the specified number of calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Materials list of items proposed to be provided under this Section;
  - 2. Manufacturer's specifications and other data needed to acknowledge compliance with the specified requirements;
  - 3. Samples of the full range of colors and patterns of carpet and of exposed accessories available from the proposed manufacturers in the specified quantities;
  - 4. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
  - 5. Provide documentation that submitted materials comply with CHPS Material Specifications Section 1350 requirements for chemical emissions requirements.



- C. Submit 6" x 6" size samples for selection of color and pattern.

## PART 2 - PRODUCTS

### 2.01 RESILIENT FLOORING

- A. Vinyl Composition Tile (VCT), 12" x 12", 1/8"-thick, over leveling underlayment of polymer portland cement, or other District approved floor leveling methods.
  - 1. Sheet vinyl shall not be allowed, unless approved in writing by the District.
- B. Acceptable Manufacturers:
  - 1. Armstrong Imperial Texture (Color: 51858 Sand Drift White.)
  - 2. Azrock Premium
- C. C.O.F. = 0.6 min per ASTM D2047

### 2.02 BASE AND ACCESSORIES

- A. Rubber Base: Burke 4-inch TSB
  - 1. Wall Base shall comply with CHPS Material Specifications Section 01 35 00 requirements for chemical emissions requirements.
- B. Corner Treatments
  - 1. At outside corners, provide pre-molded topset outside corner pieces. Pre-molded pieces shall be same style, color, and manufacturer as straight wall base.
  - 2. At inside wall corners, butt together two separate pieces of wall base. Butted pieces shall have adjacent vertical edges mitered.
- C. Sub-floor Filler: Provide white, pre-mixed latex filler for leveling.
- D. Primers and Adhesives: Provide waterproof types with other characteristics recommended by flooring and base manufacturer.

## PART 3 - EXECUTION

### 3.01 SITE AND SUBSTRATE CONDITIONS

- A. Ensure that surfaces are smooth, level, and reasonably flat to within 1/8 inch in 10 feet.
- B. Ensure that surfaces are dry (maximum 7 percent moisture content) and exhibit negative alkalinity, carbonization and dusting.

- C. Maintain minimum air temperature of 70 degrees F. at flooring installation area for 3 days prior to, during, and for 24 hours after installation.
- D. Ensure that areas to receive resilient flooring are well lit during applications.

### 3.02 LEVELING

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- B. Clean floor and apply, trowel and float filler coat to leave smooth, hard, flat surface. Prohibit traffic until filler is cured.

### 3.03 INSTALLATION

- A. Clean substrate. Spread adhesive evenly in quantity recommended by manufacturer to ensure adhesion over entire area of installation. Spread only enough adhesive to permit installation of flooring before initial set.
- B. Set in place, press with heavy roller where possible, but by any method, ensure full adhesion.
- C. Scribe flooring to stringers, risers, and other appurtenances and protrusions to produce tight joints.
- D. Provide welded joints and sheet flooring per manufacturer's specifications.

### 3.04 PROTECTION

- A. Prohibit traffic from finished installation. Lay at least one layer of construction paper down. Maintain this coverage until time for final inspection by Owner.

### 3.05 CLEAN-UP AND REPLACEMENT MATERIALS

- A. Remove excess adhesive from surfaces without damage to flooring.
- B. Clean surfaces in accordance with manufacturer's printed recommendations.
- C. Leave replacement materials equaling 100 sq. ft. of vinyl flooring, a full gallon of adhesive, and 20 feet of each base.
- D. After final cleaning and removal of construction paper protection, wax and buff floors with owner approved material.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY OF CONSIDERATIONS AND DISTRICT CRITERIA

- A. The District has established the following listed products as standards for the listed applications.
- B. The selection was derived from a desire to minimize long term maintenance, establish uniform cleaning procedures throughout the District, and reduce inventory issues when emergency replacement is required.
- C. The listed products each use high quality carpet yarn systems. Care should be given to acceptance of substitutes.
- D. The on-going debate over moisture vapor control methods is particularly relevant in the District, given the high water table. Architect recommends using the listed methods and products in a coordinated fashion with the concrete criteria established in Section 03 33 70 in order to minimize potential water vapor issues from developing.
- E. Where water vapor contents exceed manufacturers minimum, contact manufacturer for recommended mitigation.
- F. When selected by the District, a "border" may be included in designated areas – see the plans.

1.02 SECTION INCLUDES

- A. Carpeting
- B. VCTT (Vinyl Cushion Tufted Textile).
- C. Accessories.

1.03 OTHER APPLICABLE SECTIONS – See also the following:

- A. 09 62 50 – Walk-off Mats including "Geo-Tile".
- B. 09 65 00 – Resilient Flooring.

1.04 WARRANTY

- A. CPT-1: Provide manufacturers standard, printed 25-year, non pro-rated warranty against the following defects, for the stated period, after acceptance of installation:

1. Edge Ravel: No edge ravel based on normal use, wet and dry condition of use, and without use of seam sealers for lifetime of material.
  2. Secondary Back Adhesion: The cushion and backing system will have no delamination based on normal use, for the life of the installation.
  3. Tuft Bind: No edge raveling, yarn zippering or yarn pulls as determined by the non pro-rated warranty.
  4. Excessive Static Electricity, defined as exceeding 3.0 Kilovolts at 20% RH and 70 degrees F per AATCC 134 for lifetime of material.
  5. Manufacturers published warranty for stain release.
  6. Manufacturers published warranty for colorfastness.
- B. Use of chair pads shall not be a pre-condition for warranty coverage.
- C. Carpeting exhibiting defects as defined shall be replaced or repaired by the manufacturer. Secondary warranties involving those other than the manufacturer are not acceptable.

#### 1.05 CONTRACTORS GUARANTY

- A. Provide guaranty, in Architect approved form, against the following defects for a period of 5 years after acceptance of installation:
1. Doming, wrinkling or delamination from substrate.
  2. Separation, lifting, puckering or other seam defects.
  3. Loose yarn tufts, strays or other yarn pieces at seams or edges.

#### 1.06 REGULATORY REQUIREMENTS

- A. Provide glue-down or firm cushion installation that compiles with CBC Section 11B-302.2.
- B. Carpet shall have a level loop, textured loop, level-cut, or level-cut/uncut pile texture and minimum pile height of ½" per CBC Section 11B-302.2.
- C. Carpet edges shall comply with CBC Section 11B-302.2.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. District Standard: Characteristics of specific products, where named in this Section, are provided as "District Standard" product and are indicated to establish required level of quality, appearance and performance. The selection was derived from a desire to minimize long term maintenance, establish uniform cleaning procedures throughout the District, and reduce inventory issues when emergency replacement is required.
- B. The District and Architect may consider comparable products by alternate manufacturers where listed, and requests for substitutions, under the provisions of Section 01 63 00.

## 2.02 CARPET

- A. Collins & Aikman Floorcoverings, Inc. DBA Tandus:
1. Main office: Collins & Aikman Floorcoverings, DBA Tandus: 311 Smith Industrial Boulevard (Post Office Box 1447) Dalton, Georgia 30722-1447. Phone: 1-706-259-9711. Web: <http://www.tandus.com>
  2. Local contact: Collins & Aikman Floorcoverings, DBA Tandus: 1231 East Dyer Road, Suite 155; Santa Ana, California 92705. Contact; Mr. Jack Vombaur, account executive or Ms. Raelene Barress, Assistant. Phone: 1-800-241-4902 x1605
- B. Type: VCTT / Vinyl Cushion Tufted Textile. The wear layer will be Anton type 6.6. The backing will be vinyl cushion with a pre-applied adhesive to 100% of the backing.
- C. Series/Style: C&A Powerbond.
- D. Construction:
1. Minimum gauge/stitch count: 1/12 inch / 9.5 stitches per inch.
  2. Wear layer minimum weight: 18 oz face weight
  3. Product density: factor 10,588
  4. Pile Height: 0.117 inch average
  5. Wear Layer: DuPont Type 6.6, Antron Legacy and Lumina BCF Nylon with Ensure soil resistant treatment.
    - a. Alternate yarn manufacturers are not acceptable.
- E. Backing: 6' Powerbond cushion RS
1. Primary: synthetic / non-woven.
  2. Secondary: vinyl cushion Powerbond with pre-applied adhesive to 100% of the backing at the time of manufacturing.
- F. Fire/Habitability Criteria
1. Critical Radiant Flux: Minimum 0.45 w/sq cm per ASTM E 648, (Class 1 per UFC Appendix IV).
  2. Smoke Density: 450 or less, per ASTM E 662.
  3. Static Propensity: 3.0 KV or less per AATCC 134.
- G. Air quality:
1. Comply with State of Washington criteria for indoor air criteria, including VOC and particle emissions or approved equivalent test standard.
  2. No detectable levels of formaldehyde or 4-PC.

- H. Color: To be determined by the Architect, from the Contractor's submittal. Border only included where District determines a part of the project scope. See contract documents if designated "carpet" areas are to receive a border.

## 2.04 OTHER MATERIALS

- A. Carpet Tape: If used, shall be as recommended by carpet manufacturer.
- B. Adhesives: Types of adhesives, spread rates and application methods shall be in strict accordance with ASTM E662 and adhesive manufacturer's written recommendations.
- C. Carpet Reducer and Base: Vinyl, manufacturer's standard color to match carpet, manufactured by Mercer Plastics Company, or other approved.
- D. Vinyl Filler Strip: Manufactured by Mercer Plastics Company, or other approved.
- E. Divider-Saddle: PVC, flame retardant, self-extinguishing, manufactured by Mercer Plastics Company, or other approved.
- F. Crack Filler: Latex base type.

## PART 3 – EXECUTION

### 3.01 INSTALLATION AND PLACEMENT CONSIDERATIONS

- A. Moisture Testing
  - 1. Conduct anhydrous calcium chloride testing using prepackaged kit systems approved by flooring manufacturer.
  - 2. Provide test at coverage rate required by flooring manufacturer, with minimum of 3 tests/first 1,000 square feet and 1 test per each 1,000 square feet after. Distribute uniformly throughout building. Prepare map or diagram of test locations in each building.
  - 3. Conduct one set of tests 60 days prior to scheduled flooring installation. Submit test results to Architect within 48 hours of test receipt.
  - 4. Conduct second set of tests 14 days prior to scheduled flooring installation. Submit test results to Architect within 48 hours of test receipt.
  - 5. Submit testing to Architect prior to beginning slab preparation or flooring work.
- B. Evaluate floor surface. Prepare surface and apply filler to all floor surfaces exhibiting the following characteristics: Cracks, gouges or holes exceeding 1/16 inch in any dimension.
  - 1. Cracks with adjacent surfaces exceeding 1/16 inch in height.
  - 2. All expansion, weakened plane or construction joints.
  - 3. All surfaces exhibiting rough or abraded texture exceeding 1/16 inch amplitude. All surfaces with gap exceeding 3/16 inch under 10 foot metal straight edge.

C. Filler Installation:

1. Prepare existing concrete substrate as recommended by filler manufacturer, including mechanical shot-blasting or equivalent.
2. Acid etching is not acceptable.
3. Prepare existing cracks in substrate as recommended by manufacturer.
4. Apply filler and trowel to leave a smooth, flat, hard surface.
5. Prohibit traffic from area until filler is cured. Vacuum clean substrate.

D. Floor Preparation:

1. Remove all outlet floor plates and utility covers, doorstops, and similar components. Label and store for re-installation. Note floor-mounted doorstops shall not be reinstalled. Contact the Architect, when found, to determine the appropriate alternate wall-mounted door stop.
2. Remove all curing compounds, waxes, grease, paint and other coatings by Architect approved means. Vacuum substrate clean.
3. Apply primers as recommended by carpet manufacturer.

E. Prohibit traffic from carpet areas for 24 hours after installation.

F. Provide non-staining, slip resistant traffic path protection until final cleaning.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Prepare and provide painted finish to exposed surfaces based on the materials and products specified herein and per the painting scheduled in Part 3 of this section as needed for a complete and proper coverage.
- B. Related requirements.
  - 1. Pertinent provisions of the Contract Documents.
  - 2. Priming or priming and finishing of certain surfaces may be specified to be factory-performed or installer-performed under other sections.
- C. Work not included.
  - 1. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces and duct shafts.
  - 2. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require painting under this section except as may be so specified.
  - 3. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators, linkages, sensing devices, and motor shafts, unless otherwise indicated.
  - 4. Do not paint over required labels or equipment identification, performance rating, name or nomenclature plates.
  - 5. Do not paint concrete which has been sandblasted, unless so indicated.
- D. Definitions.
  - 1. "Paint," as used herein, means coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers and other applied materials whether used as prime, intermediate or finish coats.

1.02 QUALITY ASSURANCE

- A. Provide adequate numbers of skilled personnel 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.
- B. Paint Coordination.



1. Provide finish coats which are compatible with the prime coats actually used.
  2. Review other sections of these specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
  3. Upon request, furnish information on the characteristics of the specific finish materials to assure that compatible prime coats are used.
  4. Provide barrier coats over non-compatible primers, or remove the primer and re-prime as required.
  5. Notify the Architect in writing of anticipated problems in using the specified coating systems over prime coatings supplied under other sections.
- C. Codes and Standards.
1. Conform to California Air Resources Board (CARB) Rules, especially 1113.
  2. Comply with South Coast Air Quality Management District Rules.
  3. Conform to applicable code for flame/fuel/smoke rating requirements for finishes.

#### 1.03 SUBMITTALS

- A. Comply with pertinent provisions of General Conditions and Section 01 33 00.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
1. Materials list of items proposed to be provided under this section;
  2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- C. Samples.
1. Following the selection of colors and glosses by the Architect, submit samples for the Architect's review.
    - a. Provide three samples of each color and each gloss for each material on which the finish is specified to be applied.
    - b. Except as otherwise directed by the Architect, make samples approximately 8" x 10" in size.

- c. If so directed by the Architect, submit samples during progress of the work in the form of actual application of the approved materials on actual surfaces to be painted.
2. Revise and resubmit each sample as requested until the required gloss, color and texture is achieved. Such samples, when approved, will become standards of color and finish for accepting or rejecting the work of this section.
3. Do not commence finish painting until approved samples are on file at the job site.

#### 1.04 MOCK-UP

- A. Before proceeding with paint application, finish one complete surface of each color scheme required, clearly indicating selected colors, finish texture, materials and workmanship. If approved, sample area will serve as a minimum standard for work throughout.

#### 1.05 ENVIRONMENTAL CONDITIONS

- A. Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45 degrees F., unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following minimums:
  1. Gypsum wallboard: 12 percent.
  2. Cementitious materials: 12 percent.
- C. Ensure surface temperatures and surrounding temperatures are above 50 degrees F. before applying finishes.
  1. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces, unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect.
  2. Applications may be continued during inclement weather only within the temperature limits specified by the paint manufacturer as being suitable for use during application and drying periods.
- D. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 50 degrees F. for 24 hours before, during, and 48 hours after, application of finishes.
- E. During painting, provide minimum of 50 foot candles of lighting on surfaces to be painted.

## 1.06 MAINTENANCE MATERIALS

- A. Upon completion of the work of this section, deliver to the Owner an extra stock equaling three full gallons of each color, type, and gloss of paint used in the work, tightly sealing each manufacturer's container, and clearly labeling with contents and location where used.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of Section 01 52 00.
- B. Deliver paint materials in sealed original labeled containers bearing manufacturer's name, type of paint, brand name, solids content, color designation and instructions for mixing and/or reducing.
- C. Provide adequate storage facilities. Store paint materials at minimum ambient temperatures of 45 degrees F. in well ventilated area.
- D. Take precautionary measures to prevent fire hazards and spontaneous combustion.

## 1.08 PROTECTION

- A. Adequately protect other surfaces from paint and damages. Repair damages as a result of inadequate or unsuitable protection.
- B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from soiling surfaces not being painted and in particular, surfaces within storage and preparation areas.
- C. Place cotton waste cloths and materials which may constitute a fire hazard in closed metal containers and remove daily from site.
- D. Remove or cause to have removed, electrical plates, fittings, fastenings, escutcheons and hardware prior to painting operations. These items are to be carefully stored, cleaned and replaced upon completion of work in each area. Do not use solvents or other harsh cleansers on surfaces which could be damaged by such use of materials.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Dunn Edwards
  - 2. ICI Dulux,
  - 3. Spectra-Tone
  - 4. Vista

## 2.02 PAINT MATERIALS

- A. Accessories: Provide materials in compliance with the governing environmental agencies not specifically specified but required to achieve finishes.
- B. Paints and coatings: Provide ready-mixed type except field-catalyzed coatings; pigments fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixtures.
- C. Provide paints and coatings with good flowing and brushing properties and capable of drying or curing free of streaks and sags.
- D. Exterior paint: Acrylic, semi-gloss
- E. Interior paint: Acrylic, semi-gloss
- F. Provide paint with surface reflectance of 60% for walls and 85% for ceilings, minimum, at all instructional areas.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing of conditions potentially detrimental to proper application. Do not commence until satisfied that defects and deficiencies in surfaces have been rectified.

### 3.02 PREPARATION OF SURFACES

- A. Thoroughly clean all surfaces to be painted with hydro-cleaning process to remove chalk, dirt and other deleterious materials where such cleaning methods are practical. Spot prime before application of finish coats.
- B. Remove dirt, grease and oil from canvas and cotton covered insulated materials such as pipes and ducts.
- C. On surfaces to be cleaned which cannot be hydro-cleaned, where possible, wash with solution of TSP and thoroughly rinse.
- D. Patch and prime cementitious materials.
- E. Remove contamination from gypsum board surfaces and prime to show defects, if any. Paint after defects have been remedied.
- F. Remove surface contamination and oils from zinc coated/galvanized surfaces, wash with solvent, apply etching primer or as recommended by paint manufacturer and confirmed with metal manufacturer.
- G. Remove dirt, loose scale, powder, mortar and other foreign matter from cementitious surfaces which are to be painted or to receive sealer. Remove oil and grease with TSP solution, rinse well and allow to thoroughly dry.

- H. Remove stains from cementitious surfaces caused by weathering of corroding materials with a solution of sodium metasilicate after being thoroughly wet with water. Allow to thoroughly dry.
- I. Fill hairline cracks, small holes and imperfections. Smooth off to match adjacent surfaces. Wash and neutralize high alkali where they occur.
- J. Remove grease, rust, scale, dirt and dust from steel and iron surfaces. Where heavy coatings of scale are evident, remove by wire brushing, sandblasting or other method necessary, practical and in accordance with Steel Structures Painting Council.
- K. Clean unprimed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring welded joints, bolts and nuts are similarly cleaned. Prime surfaces to indicate defects, if any. Paint after defects have been remedied.
- L. Sand and scrape shop primed steel surfaces to remove loose primer and rust. Feather out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare surfaces.
- M. Wipe off sanding dust and grit from miscellaneous wood and carpentry items prior to priming. Spot coat knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand between coats. Backprime interior and exterior woodwork.

### 3.03 APPLICATIONS

- A. Apply each coat at proper consistency.
- B. Each coat of paint is to be slightly darker than preceding coat unless otherwise directed, or finish is clear.
- C. Sand lightly between coats to achieve required finish.
- D. Do not apply finishes on surfaces that are not sufficiently dry.
- E. Allow each coat to dry before following coats are applied.
- F. Backprime wood which is to receive paint or enamel paint, with enamel undercoat paint.
- G. All wood doors shall be primed and painted with two coats of semi-gloss enamel. Prime top and bottom edges of wood doors with enamel undercoating when they are to be painted.
- H. Flame retardant coatings to be applied to all exposed wood surfaces prior to applying stain and/or paint as per the manufacturer's instructions.
- I. All exterior stucco surfaces to be painted regardless that integral color is used.
- J. Do not paint over rated labels and/or any identification label or tag.

### 3.04 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to mechanical and electrical sections of these specifications, as well as drawings, with respect to painting and finishing requirements, color coding, identification banding of equipment, ducting, piping and conduit.
- B. Remove grills, covers and access panels for mechanical and electrical systems from location and paint separately.
- C. Finish paint primed equipment to colors selected.
- D. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with a pre-finished coating, or are not exposed to view. All roof top mechanical units shall be field-painted regardless of finish per appropriate painting specification.
- E. Replace identification markings on mechanical and electrical equipment when painted over or spattered.
- F. Paint interior surfaces of air ducts, convactor and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sightline. Paint dampers exposed immediately behind louvers, grilles, convactor and baseboard cabinets to match face panels, as applicable.
- G. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
- H. Color code equipment, piping, conduit and exposed ductwork of mechanical and electrical work. Color banding and identification shall include flow arrows, naming, numbering, stenciling, etc.
- I. All synthetic plaster surfaces, both interior and exterior shall be painted regardless of integral color.

### 3.05 CLEANING

- A. As work progresses and upon completion, promptly remove paint where spilled, splashed, smeared and splattered.
- B. During progress of work, keep premises free from unnecessary accumulations of tools, equipment, surplus materials and debris.
- C. Upon completion of work, leave premises neat and clean, to satisfaction of Owner.

### 3.06 PAINTING SCHEDULE

- A. Exterior gloss acrylic wood finish.
  - 1. Ameritone W2600.
  - 2. Dunn-Edwards Rancho II House Trim E60 Series.
  - 3. Sinclair GX22.

- B. Exterior Trim Enamel.
1. Ameritone: 6300 Interior/Exterior Quick Drying Semi-Gloss Enamel (Acrylic).
  2. Dunn-Edwards DE-10SYN-LUSTRO.
  3. Sinclair 8400 Aqua Sash Enamel.
- C. Exterior Acrylic Masonry Paint.
1. Ameritone Y500 Flat Enamel.
  2. Dunn-Edwards Evershield W701 Series or W704 AGRI-, Flat.
  3. Sinclair Stuc-O-Life 1300 Series.
- D. Wood Stain-Interior and Exterior
1. Ameritone W600 Solid Color Stain.
  2. Dunn-Edwards WP3 Weather-Pro, Semi-Transparent or ACRI-Hues Acrylic Latex W-703 Solid Color.
  3. Olympic.
  4. Sinclair Stainteke 7945 Series Semi-Transparent.
- E. Exterior Wood Primer.
1. Ameritone Exterior Wood Primer 1252.
  2. Dunn-Edwards W708 EZ Prime.
  3. Sinclair 248 Sash and Trim Primer.
- F. Ferrous Metal Primer.
1. Ameritone 54 Multi-Pigment Primer.
  2. Dunn-Edwards, Red Oxide Primer 43-4 Bloc-Rust.
  3. Sinclair No. 15 Red Oxide Primer.
- G. Galvanized Metal Primer.
1. Ameritone W2105 100% Acrylic Galvanized and Metal Primer.
  2. Dunn-Edwards Galvanized Aluminum QD43-7.
  3. Sinclair No. 14 CORRO Prime.
- H. Pretreatment for Galvanized Metal.
1. Ameritone, Properly clean and etch.
  2. Dunn-Edwards Galva-Etch GE123.
  3. Sinclair Vinyl Wash Primer 7113.
- I. Primer for Aluminum.
1. Ameritone 51-Zinc Chromate Primer.
  2. Dunn-Edwards QD43-7 Galv-Alum.
  3. Sinclair No. 14 CORRO Prime.

- J. Pigmented Wall Sealer for Plaster and Concrete.
1. Ameritone 77 Pigmented Primer Sealer.
  2. Dunn-Edwards Acrylic Seal E28.12.
  3. Sinclair 895.
- K. Pigmented Wall Sealer - PVA type for Gypsum Wallboard.
1. Ameritone PA360 P.V.A. Sealer.
  2. Dunn-Edwards Vinylastic Pigmented Wall Sealer W101.
  3. Sinclair Pigmented PVA Sealer 1770.
- L. Interior Flat Wall Paint - Vinyl Latex type.
1. Ameritone Y400 Interior Latex Flat Wall Paint.
  2. Dunn-Edwards Decovel W401.
  3. Sinclair Sinwall No. 1700.
- M. Enamel Undercoat - Interior.
1. Ameritone No. 8.
  2. Dunn-Edwards Enamel Undercoat Super U-365, E22-1 as applicable.
  3. Sinclair Sinco Prime Undercoat 975.
- N. Block Filler.
1. Ameritone PA010 or W2147 Interior/Exterior Quick Drying Semi-Gloss Enamel.
  2. Dunn-Edwards Blocfil W304 (Interior) (Medium Aggregate) W305 (Exterior) (Smooth).
  3. Sinclair Vinyl Block Primer 1010 (Interior) 320 (Exterior).
- O. Gloss Enamel - Interior Acrylic Type.
1. Ameritone 6500 Gloss Enamel.
  2. Dunn-Edwards 10 SYN-LUSTRO.
  3. Sinclair GX22 Sash and Trim Enamel.
- P. Semi-Gloss Enamel - Interior Acrylic Type.
1. Ameritone W2200 Interior Acrylic Semi-Gloss Enamel.
  2. Dunn-Edwards Satin Sheen II Semi-Gloss E5 Series.
  3. Sinclair 5G45 SINCO Speed Enamel.
- Q. Stain to be recoated with varnish or lacquer.
1. Creative Stain.
  2. Dunn-Edwards Decolac Lacquer Stain LQ 120 Series or Stain-Seal V108.
  3. Sinclair Colormatic Wood Stain 3350 Series.



- R. Clear Resin Sealer for Wood.
1. Ameritone 122 Swift Wood.
  2. Dunn-Edwards Resinseal V-195.
  3. Sinclair McCloskey Sanding Sealer.
- S. Sanding Sealer - Lacquer Type.
1. Dunn-Edwards Decolac LQ-101X.
  2. Sinclair Sanding Sealer Number 2600.
  3. Ameritone MacLac Sanding Sealer.
- T. Clear Gloss Varnish - Interior.
1. Ameritone Creative Gloss Varnish.
  2. Dunn-Edwards Syngloss V-197.
  3. Sinclair McCloskey Heirloom Gloss Varnish.
- U. Clear Semi-Gloss Varnish - Interior.
1. Ameritone No. 122 Swift Wood.
  2. Dunn-Edwards Syngloss V-199.
  3. Sinclair McCloskey Heirloom Semi-Gloss Varnish.
- V. Clear Gloss Lacquer.
1. Ameritone MacLac Gloss Lacquer.
  2. Dunn-Edwards Decolac LQ-103X.
  3. Sinclair No. 2601.
- W. Clear Semi-Gloss Lacquer.
1. Dunn-Edwards Decolac LQ-104.
  2. Sinclair No. 2602.
  3. Ameritone MacLac Clear Gloss.
- X. Spar Varnish - Exterior.
1. Ameritone Creative Spar.
  2. Dunn-Edwards V-121 Exterior Gloss Varnish.
  3. Sinclair McCloskey Heirloom Man-O-War Gloss Varnish.
- Y. Fire Retardant Coating.
1. Flammort.
  2. National Certified Flame Retardants, Huntington Beach, CA, distributed by Dunn-Edwards Paints.

### 3.07 PAINT SYSTEMS

#### A. Interior (Semi-gloss).

1. Plaster and Concrete - Type J, P.  
1st Coat - Pigmented Wall Sealer (Acrylic type).  
2nd Coat - Flat Wall Paint (Vinyl Latex type).
2. Gypsum Wallboard (Drywall) - Type J, O and P.  
1st Coat - Pigmented Wall Sealer (PVA type).  
2nd Coat - Flat Wall Paint (Vinyl Latex type).

#### B. Interior (Enamel).

1. Plaster and Concrete - Type O, P.  
1st Coat - Pigmented Wall Sealer (Acrylic type).  
2nd Coat - Enamel Undercoat.  
3rd Coat - Enamel-Gloss as directed (Acrylic type).
2. Gypsum Wallboard - Type K.  
1st Coat - Pigmented Wall Sealer (PVA type).  
2nd Coat - Enamel Undercoat.  
3rd Coat - Enamel-Gloss as directed (Acrylic type).
3. Metal - Type F, H, I.  
1st Coat - Ferrous Metal Primer. Galvanized Metal Primer.  
2nd Coat - Enamel Undercoat.  
3rd Coat - Enamel-Gloss as directed.

#### C. Interior (Stain and Varnish)

1. Wood - Type Q, R, U.  
Stain - As directed.  
Filler - As selected; Wood Paste Filler.  
Sealer - Clear Resin Sealer.  
Two coats - Clear Gloss Varnish, or Clear Semi-Gloss Varnish.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide the finish work of this section where indicated and scheduled on the drawings, specified here-in and as needed for a complete and proper installation.
- B. Related Requirements:
  - 1. General provisions of the contract documents included but not necessarily limited to, General Conditions, Supplementary Conditions and related sections in Division One of the Project Manual.

1.02 RELATED WORK IN OTHER SECTIONS

- A. Plaster.
- B. Gypsum board.
- C. Painting.
- D. Pre-finished wall panels.
- E. Sanitary wall and ceiling panels.

1.03 QUALITY ASSURANCE:

- A. Codes and References:
  - 1. Title 24, C.C.R. Part 2, 2016 C.B.C.
  - 2. (ASTM) American Society for Testing and Materials
  - 3. (CFFA) Chemical Fabrics and Film Association
  - 4. (UL) Underwriters Laboratories
- B. Use adequate numbers of skilled personnel 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 specified.
- C. Mock-ups:
  - 1. Provide on site where accepted by the Architect, a mock-up panel of the work of this Section.

- a. Make the mock-up panel shall be full wall height high by three full fabric widths wide.
  - b. Provide one mock-up panel for each color and pattern of vinyl-coated fabric wall covering used on the Work.
  - c. The mock-ups may be part of the Work, and may be incorporated into the finished Work, when so accepted by the Architect.
  - d. Revise as necessary to secure the Architect's approval.
- 2. The mock-up panels, when accepted by the Architect, will be used as datum points for comparison with the remainder of the work of this Section for the purpose of acceptance or rejection.
  - 3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the work of this Section.

#### 1.04 SUBMITTALS

- A. Comply with pertinent provisions of the General Conditions and Section 01 34 00.
- B. Product data: Within the specified time frame after the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Materials list of items proposes to be provided under this Section;
  - 2. Manufacturer's specifications and other data needed to reflect compliance with the specified requirements;
  - 3. Samples of the full range of colors and patterns available from the proposed manufacturer in the specified range;
  - 4. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
- C. All adhesives and sealants used on the interior of the building (inside the weatherproof membrane) shall comply with the requirements of the California Department of Health Services *Standard for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers*, including 2004 Agenda. Submit to the Architect emission test data produced by acceptable testing laboratory listed in Quality Assurance Article for materials as required in each specific Specification section. Provide data to the Architect on manufacturers' recommended maintenance, cleaning, refinishing and disposal procedures for materials and products. These procedures are for final Contractor cleaning of the project prior to substantial completion and for provided materials and products as required by the specific specification sections.

- D. Provide data to the Architect that the composite-wood products contain no added urea formaldehyde.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Section 01 62 00.

#### 1.06 MAINTENANCE

- A. Deliver to the Owner for his use in future modifications, an extra stock of approximately 5% of each color and pattern of material, and proper adhesive, used in the work of this Section, packaging each type of material separately, distinctly marked, and adequately protected against deterioration.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. Materials shall be ordered not less than 60 days prior to the scheduled installation date.
- B. Vinyl wall covering shall be the product of one manufacturer.
- C. Vinyl-coated fabric wall covering: Provide Koroseal fabric in "Linden" with Teflon pattern, Division of RJF International Corp., in color as selected by the Architect from the manufacturer's standard or equal product accepted in advance by the Architect.
- D. Physical properties:
  - 1. Manufacturer's specifications in compliance with C.B.C., CH.8, 803.5 Class I/025 and UL rating, ASTM E-84 Tunnel Test:
    - a. Flame Spread: 10
    - b. Smoke Developed: 5
- E. Equal Product:
  - 1. Proprietary products and methods of the work are specified herein to establish the quality of material, design and finish, yet not to eliminate competition of other manufacturers from the Work.
  - 2. Provide the product upon which the design is based, or submit equal products ten (10) calendar days prior to bid date to be accepted in advance by the Architect in writing by addendum, in compliance with the General Provisions of the General Conditions and Section 01 63 00, prior to bid date.

## 2.02 OTHER MATERIALS

- A. Provide a heavy-bodied water-soluble adhesive recommended by the manufacturer of the accepted fabric.
- B. At external corners and at exposed edges of fabric, provide extruded aluminum trim from alloy 6063-T5, one-piece full length, with fine satin finish and class II clear coating complying with AA-M21-A31, in type recommended for the use by the manufacturer of the accepted fabric.
- C. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the acceptance of the Architect.

## PART 3 - EXECUTION

### 3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed with work until unsatisfactory conditions are corrected.
- B. Make moisture content tests of substrate by use of an electronic moisture meter accepted by the Architect, and verify that substrate moisture content does not exceed:
  - 1. For plaster and gypsum board: 5%;
  - 2. For masonry and concrete: 12%

### 3.02 PREPARATION

- A. Metal:
  - 1. Clean the surface free from rust, scale, grease, oil, and other contaminants.
  - 2. Prime bare metal with a metal primer recommended for the purpose by the manufacturer of the accepted fabric.
- B. Gypsum board and plaster:
  - 1. Over gypsum board, apply a uniform release coat of material recommended by the manufacturer of the accepted adhesive.
  - 2. Dust the surface thoroughly and remove all loose material.
  - 3. Verify proper moisture content.

### 3.03 INSTALLATION OF METAL MOLDING

- A. Install the accepted molding at external corners and at exposed edges of fabric, using adhesive recommended for the purpose by the manufacturer of the molding, installing true to line, using full-length stock to the maximum practicable, butting horizontal joints to form a tight hairline crack, and mitering corners.

### 3.04 INSTALLATION OF FABRIC

- A. Sequence:
  - 1. Use fabric in consecutive numerical sequence of their manufacturer.
  - 2. Place fabric panels sequentially in the exact order they are cut from the roll, including for filling all spaces above doors and above or below windows and similar locations.
- B. Handle the fabric in strict accordance with the manufacturer's recommendations as accepted by the Architect.
  - 1. Trim additional selvage where required to achieve a color and pattern match at seams.
  - 2. Follow the manufacturer's printed instructions for mixing adhesive.
  - 3. When overlapping the edges and double-cutting through both thicknesses, exercise care to prevent cutting the substrate.
  - 4. Wrap fabric 6" beyond inside and outside corners; not cutting at corners except when color of fabric selected is different on adjacent walls.
  - 5. Do not permit horizontal seams.
  - 6. Install the fabric prior to installation of plumbing fixtures, casing, bases, and cabinets.
  - 7. Use stiff bristled brush or flexible broad knife to eliminate air pockets and to secure fabric to substrate surfaces.
  - 8. Using a damp sponge, remove excess adhesive from each seam as it is made, wiping clean and dry with a cloth towel.

### 3.05 ADJUSTMENT AND CLEANING

- A. Verify that installed fabric meets or exceeds the quality of installation achieved in the accepted mock-up panels.
- B. Visually inspect to verify that installed fabric is secure, smooth, clean, without wrinkles, and with no gaps or overlaps.

- C. Inspect all seams, verifying that precise match has been achieved, and correcting mismatch of color and/or pattern as necessary to secure the Architect's acceptance.
- D. As the work progresses, clean the surplus adhesive from fabric surfaces and adjacent surfaces.

END OF SECTION



PART 1 - GENERAL

1.01 SUMMARY

- A. Provide miscellaneous accessories, attachment devices, and required rough-in frames for the accessories indicated on drawings and specified herein for neat, complete and proper installation.

1.02 RELATED REQUIREMENTS

- A. General Provisions of the Contract Documents.
- B. Blocking necessary and unframed mirrors.

1.03 SUBMITTALS

- A. Comply with the General Provision of the General Conditions and Section 01 34 00.
- B. Samples: Submit one sample of each item and model specified.
- C. Manufacturer's catalog and data sheets, parts list, and installation requirements for each accessory item specified.
- D. Maintenance, operating instructions and keys required for each type of equipment and lock.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of Section 01 52 00.
- B. Deliver items in manufacturer's original unopened protective packaging.
- C. Store materials in original protective packaging to prevent soiling, physical damage or wetting.
- D. Handle so as to prevent damage to finished surfaces.
- E. Maintain protective covers on all units until installation is complete. Remove covers at final clean-up of installation.

1.05 GUARANTEE

- A. Mirrors guaranteed for 15 years against silver spoilage. Accessories guaranteed to be free from defects in workmanship and material for a period of one year.

## PART 2 - PRODUCTS

### 2.01 ACCESSORIES

- A. Toilet Tissue Dispenser: Bobrick B-3888 with theft resistant spindle. Locate where indicated at all W.C.'s. Holder shall not extend out beyond the grab bar. Maximum 3" projection from wall.
- B. Sanitary Napkin Disposal: Bobrick B-353. Located on the grab bar side of an accessible toilet stall and shall not project more than 3" from the wall surface nor be located closer than 1 1/2" clear of the tangent point of the grab bar. Bobrick B-354 – partition mounted.
- C. Accessible Grab Bars: Bobrick Bar B-6806 series. Side wall 48" long, back wall 36" long. Locate where indicated.
- D. Mirrors (Staff & Faculty): Bobrick B-292 1836 Series with shelf. Locate where indicated.
- E. Mirrors (Students): Bobrick B-290 1824 . Locate where indicated.
- F. Seat Cover Dispenser: Bobrick B-221. Locate at all toilets.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Check wall opening for correct dimensions, plumbness of blocking or frames, and other preparation that would affect installation of accessories.
- B. Check areas to receive surface-mounted units for conditions that would affect quality and execution of work.
- C. Verify spacing of plumbing fixtures and toilet partitions that affect installation of accessories.
- D. Do not begin installation of washroom accessories until openings and surfaces are acceptable.

### 3.02 INSTALLATION

- A. Install accessories at locations and heights indicated, level and plumb. Installation methods shall be in accordance with manufacturer's recommendations. All exposed fasteners to be tamper-proof. Finish of exposed fasteners to match items secured.
- B. Install all accessories, such as paper holders, soap dispensers, grab bars, hand and hair dryers, etc., per 2016 CBC Section 11B-603.5.
- C. Install manufacturer's recommended anchor system for all grab bars and per Title 24, Part 2, Table 11B-604.5.
- D. Conceal evidence of drilling, cutting and fitting on adjacent finishes.

restroom accessories

- E. Fit flanges of accessories snug to wall surfaces. Provide for caulking in gaps between 90 degrees. Return flanges and finish wall surface after accessories are installed.

### 3.03 ADJUST AND CLEAN

- A. Adjust accessories for proper operation.
- B. Clean and polish exposed surfaces prior to final inspection.
- C. Deliver accessories schedule, keys and parts manual as part of project close-out documents. For Owner's permanent records, provide two sets of the following items of manufacturer's literature:
  - 1. Technical data sheets of each item used for the project.
  - 2. Service and parts manuals.
  - 3. Name of local representative to be contacted in the event of need of field service or consultation.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide vinyl covered tackboard panels, complete.
- B. Related Sections
  - 1. Gypsum Board.
  - 2. Vinyl Coated Fabric Wall Covering.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. D 751 Methods of Testing Coated Fabrics
  - 2. F 793-93 Classification of Wall coverings by Durability Characteristics.
  - 3. E 84-91a Test Method for Surface Burning Characteristics of Building Materials.
  - 4. C208-95 Insulating Board, Structural and Decorative
  - 5. D-1408 Stain Resistance
- B. Chemicals Fabrics and Film Association (CFFA):
  - 1. CFFA-W-101-B Quality Standard for Vinyl Coated Fabric Wallcovering.
- C. Underwriters Laboratory, Inc. (UL)
  - 1. UL 723 Test for Surface Burning Characteristics of Building Materials

1.03 SUBMITTALS

- A. Submit manufacturers' product data for each type of panel core material and fabric backed vinyl covering specified.
- B. Submit samples for verification: 8-inch square units displaying the substrate material and fabric backed vinyl coating and demonstrating quality, weight, color range and pattern variation.
- C. Submit manufacturer's written product certification that all furnished core materials and fabric backed vinyl covering meets or exceeds the specification requirements. Include certified copies of tests specified.

- D. Submit manufacturer's written instructions for recommended maintenance of vinyl covered tackboard panel specified. Include acceptable methods and materials recommended to maintain products in anticipated areas of use.

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of vinyl tackboard panel from a single source with ability to provide products of consistent quality in appearance and physical properties.
- B. Tackboard panels must be machine laminated (no hand wrapped panels) the machine process insures against the material delaminating from the panel.
- C. Installation by skilled and experienced installers with no less than three years of documented experience installing tackboard panels of this type as specified.

#### 1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver vinyl wall coverings to the project site in unbroken and undamaged original factory wrappings and clearly labeled with the manufacturer's identification label, quality or grade and lot number.
- B. Protect fabric covered tackboard panels from moisture in shipment, storage and installation.

#### 1.06 PROJECT CONDITIONS

- A. Do not begin installation until spaces for vinyl covered tackboard panels have been enclosed and continuously ventilated and heating and heated to maintain substrate surface and instructions.
- B. Maintain constant recommended temperature and humidity for at least 72 hours prior to, throughout the installation period and for 72 hours after vinyl covered tackboard panel installation completion.
- C. Verify actual wall surfaces by accurate field measurement before fabrication.

#### 1.07 WARRANTY

- A. Submit manufacturer's 5 year written warranty against manufacturing defects.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Chatfield Clarke Co. 909-823-4297 [www.chatfield-clarke.com](http://www.chatfield-clarke.com)  
Or Equal.

## 2.02 MATERIALS

### A. Class 2/B Panel Substrate:

1. Composition: Compressed wood fiber.
2. Density: 16 pcf.
3. Weight: .64 pounds per square foot.
4. Thickness: ½ inch
5. Size: 48 inches wide by height required achieving 3" above finish ceiling.
6. Fire Rating: Class 2 or B
  - a. Flame Spread: 45
  - b. Smoke Developed: 45
7. Edge Treatment: Square
8. Required Manufacturer: Emco Fiberboard [www.emco.com](http://www.emco.com) or approved equal.

### B. Fabric Backed Vinyl Covering:

1. Refer to Vinyl Coated Fabric Wall Covering Section.

## 2.03 ACCESSORIES

### A. Adhesives: Install panels with #317 Adhesive by W. W. Henry or approved equal

### B. Moldings:

1. Manufactures standard plastic cap (J) molding at door and window frames.

## 2.04 FABRICATION

- A. Apply specified primer to selected core material as recommended by core manufacturer.
- B. Apply recommended adhesive to exposed face of core.
- C. Laminate fabric-backed vinyl covering in numbered sequence from vinyl rolls to insure minimum color variation between tackable panels.
- D. Attach vinyl covering to cores to produce installed panels with visible surfaces fully covered and free from bubbles, sags, wrinkles, distortion of vinyl covering, adhesive or foreign material.

- E. Wrap panel substrate with fabric-backed vinyl, covering vertical edges and returning vinyl approximately 2 inches on back of panel.
- F. Provide sizes wall to ceiling heights and widths as indicated on the drawings.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates and installation conditions for compliance with requirements for installation tolerances.
- B. Verify opening dimensions are as indicated on shop drawings.
- C. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation. Beginning of installation means acceptance of surface conditions.

#### 3.02 INSTALLATION

- A. Install in strict accordance with Manufacturer's installation instructions.
- B. Install panels in one piece beginning at center point of the wall and working to room corners.
- C. Install adhesive to walls and tackboard panels in accordance with adhesive manufacturer's installation instructions, using recommended adhesive and concealed fasteners.
- D. Install tackboard panels in exact order as they are manufactured from the vinyl covering bolt.
- E. Install vinyl covered tackboard panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, field fabricated to fit adjoining work accurately at the borders and wall penetrations.
- F. Install moldings from manufacturer's standard plastic cap (J) molding as indicated at door and window frames.

#### 3.02 CLEAN-UP COMPLETION

- A. Clean tack board panels upon completion of installation to remove any foreign materials or adhesive in accordance with fabric backed vinyl covering cleaning instructions.
- B. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the tackboard panel installation. Leave areas in neat clean and orderly condition.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide signage as indicated and scheduled on drawings and specified herein and as needed for a complete and proper installation.

1.02 RELATED REQUIREMENTS

- A. General provisions of the contract documents.

1.03 QUALITY ASSURANCE

- A. Products and materials to be provided are to be from manufacturers and producers regularly engaged full-time in the manufacture or production of this and similar items, with a history of successful manufacture or production acceptable to the Owner.
- B. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material, except where specified product or material is superior in quality to industry and trade standards.
- C. All signage shall conform to 2016 C.B.C. Sections 11B-703.
- D. All new tactile signage must be field inspected after installation per 11B-703.1.1.2.

1.04 SUBMITTALS

- A. Comply with pertinent provisions of the General Conditions and Section 01 33 00.
- B. Submit data sufficient to demonstrate compliance with specifications and drawing requirements.
- C. Submit shop drawing and catalog cuts of items to be provided. Manufacturer or producer's standard drawings and technical information may be acceptable where complete enough to determine acceptability.
- D. Submit samples of products and materials where options of color, finish, pattern or texture exist.

1.05 PRODUCT HANDLING

- A. Deliver products and materials to the project; and store in a safe, dry place with all shop-supplied protection and labeling intact and legible until set, applied or installed.
- B. Use all reasonable means necessary to protect products and materials before, during and after installation.



- C. In event of damage, regardless of responsibility and culpability, make repairs and replacements necessary to satisfaction of Owner, and at no additional cost to Owner.

#### 1.06 WARRANTY

- A. Provide Owner with a written warranty as a condition of work acceptance, signed by Contractor and installer (where applicable), agreeing to maintain, repair and/or replace products and materials for one year following acceptance, and without additional cost to Owner.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Site Signage: Karman, Express Signs, Sign Arts, or Fragoso
- B. Interior Signage: Vomar, ASI, or Sign Arts

#### 2.02 MATERIALS

- A. Provide 1/8" thick, acrylic plastic, suede finish, with 1/4" radius corners. Use Helvetica medium, upper case letter form. Colors selected by Architect. Screw mount at 12" max. on center. Screw spacing is to prevent all buckling of signage. All signs shall be graffiti proof.
- B. Signage identifying permanent rooms and spaces shall comply with all requirements of the Americans with Disabilities Act of 1990; Title 24, Part 2, 2016 California Building Code, Section 11B-703. All signage shall conform to CBC Sections 11B-703.
- C. Proportions: Letters and numbers on signs shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. 11B-703.2
- D. Tactile letters and numerals shall be raised 1/32 inches, upper case, sans serif type and shall be accompanied with Grade 2 Braille (see 202G.) Raised characters shall be at least 5/8 inch high, but no higher than 2 inches. DOTS shall be 1/10 inch (2.54 mm) on center within each cell with 2/10 inch (5.08 mm) space between cells. Pictograms shall be accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram shall be 6 inches minimum in height.
- E. Contrast between character, symbols and their background must be 70% minimum and have a non-glare finish. 11B-703.5.1. The Characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with their background - either light characters on a dark background or dark characters on a light background.

- F. Signs shall be installed on the wall adjacent to the latch side of the door. Where there is no wall space to the latch side of the door, including at double leaf doors, signs shall be placed on the nearest adjacent wall. Mounting height shall be per Architectural Drawings. Mounting location for such signage shall be so that a person may approach within 3 inches of signage without encountering protruding objects or standing within the swing of a door.
- G. Braille Symbols: Contracted Grade 2 Braille shall be used wherever Braille symbols are specifically required in other portions of these standards. Dots shall be 1/10 inch (2.54mm) on centers in each cell with 2/10 inch (5.08mm) space between cells. Dots shall be raised a minimum of 1/40 inch (0.635mm) above the background.
- H. Rounded or domed California Braille dots, each distinct and separate per 2016 CBC 11B-703.3.
- I. Refer to drawing details for additional information.

## 2.03 PLASTIC SIGNS

- A. "Typical Room" sign: Name and number per owners / architects direction. Provide at each door. Refer to plans.
- B. "Exit" and "Exit Route" sign: Exit sign to comply with paragraph 2.02 of this Specification Section for materials and ADA requirements. Exit sign occurs at all ground level exit doors, exit route signs occur at all doors leading into an exit corridor per plans.
- C. "Fire Sprinkler Riser Inside" sign: Locate per plans.
- D. "International Sign of Accessibility" sign: Locate per plans and required by local jurisdictions.
- E. "Restroom" signs: Provide (1) for each restroom. Refer to plans.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install signs in strict accordance with manufacturer's recommendation and according to details of the drawings.
- B. Provide tamper-proof screws to attach signs, where occurs.

### 3.02 CLEANUP

- A. After completion, clean up and remove all resultant debris from the site. Keep areas clean during entire operation and leave all spaces broom clean.

END OF SECTION

PART 1 - GENERAL

1.10 WORK SPECIFIED IN THIS SECTION

- A. Provide custom design cast plaques as shown on drawings.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Building signage, graphics and directories.

1.03 APPROVAL

- A. Verify and obtain approval of the architect for the design of the plaque and all lettering (names and dates) prior to casting.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide bronze tablet with raised block flat face and ribbon flat face letters, raised bevel edge border, medium pebble background texture, dark statuary bronze finish with raised parts highlighted, clear, bake-protected.
- B. Provide complete with 5/8" diameter plain rosettes.
- C. Plaque is to be manufactured by American Bronze Crafts or other approved.
- D. Inscriptions: See Drawings.

PART 3 - EXECUTION

3.01 FABRICATION

- A. Ensure casting is free of pits and gas holes and all letters are sharp, hand-tooled, vertical and perfectly aligned.
- B. Oxidize background.
- C. Chemically clean and spray with two coats of clear acrylic lacquer.

3.02 CLEANUP

- A. After completion of the work, clean up and remove all debris and rubbish resulting from this work.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide the finish work of this section where indicated on drawings and specified herein and as needed for a complete and proper installation.

1.02 RELATED REQUIREMENTS

- A. General provisions of the contract documents.
- B. Fire extinguisher cabinets must comply with CBC Sections 11B-307, 11B-308, 11B-309, and 11B-403.

1.03 QUALITY ASSURANCE

- A. Products and materials to be provided are to be from manufacturers and producers regularly engaged full-time in the manufacture or production of this and similar items, with a history of successful manufacture or production acceptable to the Owner.
- B. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material, except where specified product or material is superior in quality to industry and trade standards.

1.04 SUBMITTALS

- A. Comply with pertinent provisions of the General Conditions and Section 01 34 00.
- B. Submit data sufficient to demonstrate compliance with specifications and drawing requirements.
- C. Submit shop drawing and catalog cuts of items to be provided. Manufacturer's or producer's standard drawings and technical information may be acceptable where complete enough to determine acceptability.
- D. Submit samples of products and materials where options of color, finish, pattern or texture exist.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of the General Conditions and Section 01 34 00.
- B. Deliver products and materials to the project; store in a safe, dry place with all shop-supplied protection and labeling intact and legible until set, applied or installed.

- C. Use all reasonable means necessary to protect products and materials before, during and after installation.
- D. In event of damage, regardless of responsibility and culpability, make repairs and replacements necessary to satisfaction of Owner, and at no additional cost to Owner.

## 1.06 WARRANTY

- A. Provide Owner with a written warranty as a condition of work acceptance, signed by Contractor and installer (where applicable), agreeing to maintain, repair and/or replace products and materials for one year following acceptance, and without additional cost to Owner.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Fire Extinguisher Cabinets: J.L. Industries Potter-Roemer, Inc., or approved equal.
  - 1. At Non-Rated Walls: Ambassador Steel #8116 with full clear acrylic glazing, pull handle, and Saf-T-Lok. Provide pressure sensitive decals or red letter, 1" high, reading "FIRE EXTINGUISHER," small instruction letters reading "In Case of Fire Pull Handle Firmly." Door shall not require more than 5 lbs. of pressure to open. Handle to project 1-1/2" min. from face of cabinet and shall not require pinching, grasping or twisting of wrist.
  - 2. At Fire Rated Walls: Ambassador Steel FX #8116 with full clear acrylic glazing, pull handle, and Saf-T-Lok. Provide pressure sensitive decals or red letter, 1" high, reading "FIRE EXTINGUISHER," small instruction letters reading "In Case of Fire Pull Handle Firmly." Door shall not require more than 5 lbs. of pressure to open. Handle to project 1-1/2" min. from face of cabinet and shall not require pinching, grasping or twisting of wrist.
  - 3. At Concrete Walls: Ambassador Steel #8113 with full clear acrylic glazing, pull handle, and Saf-T-Lok. Provide pressure sensitive decals or red letter, 1" high, reading "FIRE EXTINGUISHER," small instruction letters reading "In Case of Fire Pull Handle Firmly." Door shall not require more than 5 lbs. of pressure to open. Handle to project 1-1/2" min. from face of cabinet and shall not require pinching, grasping or twisting of wrist.
- B. Extinguishers: 10 lb. Tri-Class, multi-purpose chemical by J.L. Industries, heavy duty steel extinguishers, model COSMIC 10E. All extinguishers 2A-10BC UL rated conforming to the requirements of Title 24, Section 906, Public Safety, Title 19 California Code of Regulations - tested and fully charged.
- C. Kitchen Extinguisher: 22.5 lbs Class K by J.L. Industries model SATURN 15. All kitchen extinguishers shall be Class K UL rated – tested and fully charged.
- D. At science classrooms: UL rated 4A-80BC, 10 Lb multi purpose chemical by J.L. Industries heavy duty steel extinguisher.

### PART 3 - EXECUTION

#### 3.01 WORKMANSHIP

- A. Install equipment in strict accordance with manufacturer's instructions. F.E. handle shall be 48" A.F.F. max.

#### 3.02 CLEANUP

- A. After completion, clean up and remove all resultant debris from the site. Keep areas clean during entire operation and leave all spaces broom clean.

END OF SECTION

PART 1 - GENERAL

1.01 WORK SPECIFIED IN THIS SECTION

- A. Projection screens and accessories.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Electrical rough-in and final hook-up.

1.03 QUALITY ASSURANCE

- A. Products and materials to be provided are to be from manufacturers and producers regularly engaged full-time in the manufacture or production of this and similar items, with a history of successful manufacture or production acceptable to the Owner.
- B. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material, except where specified product or material is superior in quality to industry and trade standards.

1.04 SUBMITTALS

- A. Provide material list of items proposed to be provided.
- B. Submit data sufficient to demonstrate compliance with specifications and drawing requirements.
- C. Submit shop drawing and catalog cuts of items to be provided. Manufacturer or producer's standard drawings and technical information may be acceptable where complete enough to determine acceptability.
- D. Submit samples of products and materials where options of color, finish, pattern, or texture exist.

1.05 PRODUCT HANDLING

- A. Deliver products and materials to the project; store in a safe, dry place with all shop-supplied protection and labeling intact and legible until set, applied, or installed.
- B. Use all reasonable means necessary to protect products and materials before, during, and after installation.
- C. In event of damage, regardless of responsibility and culpability, make repairs and replacements necessary to satisfaction of Owner, and at no additional cost to Owner.

## 1.06 WARRANTY

- A. Provide Owner with a written warranty as a condition of work acceptance, signed by Contractor and installer (where applicable), agreeing to maintain, repair and/or replace products and materials for one year following acceptance, and without additional cost to Owner.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER

- A. Basis of Design: Draper Inc. or approved equal by Da-Lite Screen Co., Inc., or other approved.
- B. Platinum Visual System, or other approved.

### 2.02 WALL MOUNTED PROJECTION / DRYERASE SCREEN

- A. Platinum "Drop-In Tray System Board" ( DTS ) Series
  - 1. Platinum Visual Systems  
Corona, CA. Phone: (800)498-2990, fax: (951) 817-9900  
email: info@pvsusa.com, web: pvsusa.com
  - 2. Provide metal trim and accessories from manufactures DTS Series with aluminum extrusions with clear satin anodized finish.
    - a. Chalktray CR315
    - b. Map rail MR411
      - 1) Endstops (one pair per map rail)
      - 2) Map hooks (one every 2'-0" of map rail)
      - 3) Roller brackets (one pair per map rail)
      - 4) Flag holder (one per room)
  - 3. Frame CH215: Standard channel frame with 3/4" face.
  - 4. Size and Quantity: As shown on drawings.
  - 5. Color: Standard Bright White

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install in strict accordance with manufacturer's instructions and as detailed on drawings. Installation of switch shall be by electrical contractor.

### 3.02 CLEANUP

- A. After completion, clean up all resulting debris from this work and remove from the site.

END OF SECTION



section 22 05 17  
sleeves and sleeve seals for plumbing piping

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. Section Includes:
  - 1. Sleeves.
  - 2. Sleeve-seal systems.
  - 3. Grout.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.06 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.07 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.08 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against

dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.09 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

#### 1.10 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
  - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
  - 3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
  - 4. To be valid, all submittals must:
    - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or

changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

- b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
- c. Include all pertinent construction, installation, performance and technical data.
- d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
  - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
  - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
- e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

**B. Substitution Requirements:**

- 1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
- 2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

#### 1.11 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.12 RECORD DRAWINGS

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blue-line prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducible tracings shall be delivered to the Architect.

#### 1.13 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

## PART 2 - PRODUCTS

### 2.01 SLEEVES:

- A. Shall be plastic or galvanized steel where pipes pass through concrete walls or floor slabs.
- B. Isolate pipes through ground floor slabs with Kraft paper, plastic tape or similar materials unless conduit is specified or indicated.
- C. Sleeves for pipes through exterior walls shall be non-metallic with minimum 2" weep ring as manufactured by Link Seal. Pipe shall be sealed with Link Seal modular seal with EPDM seal elements.
- D. Sleeves in or through fire rated walls shall be per U.L. Fire Resistance System No. WL1146 for drywall construction, and U.L. Fire Resistance System No. CAJ1044 for concrete construction. See architectural plans for all locations of rated walls.
- E. Below-grade piping through exterior walls shall be sealed using Link Seal modular seal with nitrile seal elements and stainless steel bolts and sleeves as manufactured by Century Line.
- F. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- G. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- H. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

### 2.02 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. Metraflex Company (The).
  - 3. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 2. Pressure Plates: Carbon steel or Stainless steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements.

## 2.03 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.01 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  2. Cut sleeves to length for mounting flush with both surfaces.
  3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
  1. Cut sleeves to length for mounting flush with both surfaces.
  2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

### 3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

### 3.03 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  - 1. Exterior Concrete Walls below Grade:
    - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
  - 2. Concrete Slabs-on-Grade:
    - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
  - 3. Concrete Slabs above Grade:
    - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
  - 4. Interior Partitions:
    - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

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. Section Includes:
  - 1. Escutcheons.
  - 2. Floor plates.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.06 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.07 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.08 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against

dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.09 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

#### 1.10 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
  - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
  - 3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
  - 4. To be valid, all submittals must:
    - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or

changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

- b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
- c. Include all pertinent construction, installation, performance and technical data.
- d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
  - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
  - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
- e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

**B. Substitution Requirements:**

- 1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
- 2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

#### 1.11 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.12 RECORD DRAWINGS

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blue-line prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducible tracings shall be delivered to the Architect.

#### 1.13 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

## PART 2 - PRODUCTS

### 2.01 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

### 2.02 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
  - 1. Escutcheons for New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
    - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - e. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated or rough-brass finish.
    - f. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated or rough-brass finish.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

escutcheons for plumbing piping

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

### 3.02 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

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 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Ductile-iron, single-flange butterfly valves.
3. Bronze lift check valves.
4. Bronze swing check valves.
5. Bronze gate valves.
6. Iron gate valves
7. Manual circuit balancing valves.
8. Gas shut-off cocks.
9. LPG shut-off cocks.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section 220529 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.03 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.



#### 1.04 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

#### 1.05 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.06 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the

contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.07 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.08 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.09 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.10 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should

furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

#### 1.11 SUBMITTAL DATA

##### A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to

indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

## 1.12 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 2. ASME B31.1 for power piping valves.
  - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61-G and NSF-372 for valve materials for potable-water service.
  - 1. Valves for domestic water must comply with the Federal Reduction of Lead in Drinking Water Act.
    - a. "Lead Free" refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content  $\leq 0.25\%$ .
    - b. All valves must be 3<sup>rd</sup> party certified.
    - c. Bronze valves shall be made of dezincification-resistant material.

## 1.13 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## 1.14 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.15 RECORD DRAWINGS

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

#### 1.16 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

### PART 2 - PRODUCTS

#### 2.01 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Piping systems shall be supplied with valves arranged so as to give complete and regulating control of each building and piping systems throughout the building, and located so all parts are easily accessible and maintained.
  - 1. Valve Design: Rising stem or outside screw and yoke stems. Non-rising stem valves may be used where space conditions prevent full extension of rising stems.
  - 2. Sizes: Same size as upstream pipe, unless otherwise indicated.
  - 3. Extended stems: Where piping insulation is indicated or specified, valves shall be equipped with 2" extended handles of non-thermal conductive material. Also provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Supply with memory stops, which are fully adjustable after insulation is applied.

4. End Connection: 2 inch and under shall be threaded, 2-1/2 inches and larger shall be flanged or full lug style.
- C. Valves for Potable Water must comply with California Lead Free Law, effective January 1, 2010.
1. "Lead Free" refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content  $\leq 0.25\%$ . Source: California Health & Safety Code (116875).
  2. All valves must be 3<sup>rd</sup> party certified.
  3. Bronze valves shall be made with dezincification-resistant material.
- D. Where possible, valves of one manufacturer shall be used.
- E. Provide Class 150 valves meeting the valve specifications where Class 125 valves are specified but are not available.
- F. Bronze valves shall be made with dezincification-resistant materials, (Bronze ASTM B62, B61, or B584 Alloy C87850). This includes body, ball, stem and / or trim.
- G. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.
- H. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.
- I. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- J. Valve Sizes: Same as upstream piping unless otherwise indicated.
- K. Valve Actuator Types:
1. Hand-wheel: For valves other than quarter-turn types.
  2. Hand-lever: For quarter-turn valves NPS 6 and smaller.
- L. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Nib-seal handle extension or comparable product by one of the following:
    - b. General valves:
      - 1) NIBCO
      - 2) Hammond
      - 3) Milwaukee
    - c. Below grade domestic water shut-off valves (gate valves) 2" and larger:

- 1) NIBCO.
- 2) Clow.
- 3) Mueller.

d. Butterfly Valves:

- 1) NIBCO.
- 2) Demco.
- 3) Dezuric.

e. Plug Valves:

- 1) Hammond.
- 2) Milwaukee.

f. Check valves, lift type:

- 1) Hammond.
- 2) Milwaukee.

g. Below grade backwater valve isolation valves:

- 1) NIBCO.
- 2) Clow.
- 3) Mueller.

2. Butterfly Valves: With extended neck.

M. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves, ASME B16.5 for steel valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

N. Valve Bypass and Drain Connections: MSS SP-45.

## 2.02 BRONZE BALL VALVES

A. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & Nib-Seal Handle:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-595-Y-66-LF or T-595-Y-66-LF or a comparable product by one of the following,
  - a. Milwaukee Valve Company.
  - b. Apollo.
2. Description:
  - a. Standard: MSS SP-110, NSF 61-G.



- b. CWP Rating: 600 psig.
- c. Body Design: Three piece with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.
- d. Body Material: Bronze ASTM B 584 Alloy C87850 or C87600.
- e. Ends: Threaded or Solder.
- f. Seats: PTFE or TFE.
- g. Stem: 316 Stainless steel.
- h. Ball: 316 Stainless steel, vented.
- i. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & Nib-Seal Handle:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-585-66-LF or T-585-66-LF or a comparable product by one of the following:
  - a. Conbraco Industries, Inc.; Apollo Div.
  - b. Milwaukee Valve Company.
2. Description:
  - a. Standard: MSS SP-110, NSF 61-G.
  - b. CWP Rating: 600 psig.
  - c. Body Design: Two piece with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.
  - d. Body Material: Bronze ASTM B 584 Alloy C87600.
  - e. Ends: Threaded or Solder.
  - f. Seats: PTFE or TFE.
  - g. Stem: 316 Stainless steel.
  - h. Ball: 316 Stainless steel, vented.
  - i. Port: Full.

C. 200 CWP, Sizes 2-1/2" – 24", Ductile Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model LD-2000-3/5, or a comparable product by one of the following:
  - a. Cooper Cameron Corp.; Cooper Cameron Valves Div.
  - b. Tyco International, Ltd.; Tyco Valves & Controls
2. Description:
  - a. Standard: MSS SP-67, Type I, IAPMO.
  - b. NPS 24 (DN 300) and Smaller CWP Rating: 200 psig (1380 kPa).
  - c. Body Design: Full Lug type; Bubble tight shutoff, suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
  - d. Body Material: ASTM A 536, ductile iron.
  - e. Seat: EPDM.
  - f. Stem: One- or two-piece stainless steel.
  - g. Disc: Aluminum bronze

- D. Retain one or more of six paragraphs in this article if iron, single-flange butterfly valves are required. MSS SP-67 covers iron, single-flange butterfly valves NPS 1-1/2 to NPS 72.

## 2.03 BRONZE LIFT CHECK VALVES

### A. Class 125, Lift Check Valves with Nonmetallic TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-480-Y-LF or T-480-Y-LF or a comparable product by one of the following:
  - a. Hammond.
  - b. Milwaukee.
2. Description:
  - a. Standard: MSS SP-80, Type 2, NSF 61-G.
  - b. CWP Rating: 200 psig.
  - c. Body Design: Vertical flow.
  - d. Body Material: ASTM B 584 Alloy C87850, lead free bronze.
  - e. Ends: Threaded or Solder.
  - f. Disc: PTFE, or TFE.

## 2.04 BRONZE SWING CHECK VALVES

### A. Class 125, Bronze Swing Check Valves with Nonmetallic TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-413-Y-LF or T-413-Y-LF or a comparable product by one of the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Powell Valves.
2. Description:
  - a. Standard: MSS SP-80, Type 4, NSF 61-G.
  - b. CWP Rating: 200 psig.
  - c. Body Design: Y-pattern Horizontal flow.
  - d. Body Material: ASTM B 584 Alloy C87850, lead free bronze.
  - e. Ends: Threaded or Solder.
  - f. Disc: PTFE or TFE.

## 2.05 BRONZE GATE VALVES

### A. NRS Bronze Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-113-LF or T-113-LF or a comparable product by one of the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.

- b. Powell Valves.

2. Description:

- a. Standard: MSS SP-139, Type 2, NSF 61-G.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 584, dezincification-resistant bronze with integral seat and threaded bonnet.
- d. Ends: Threaded or Solder.
- e. Stem: Lead free Silicon Bronze.
- f. Disc: Solid wedge; lead free bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron.

B. RS Bronze Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-111-LF or T-111-LF or a comparable product by one of the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Powell Valves

2. Description:

- a. Standard: MSS SP-80, Type 2, NSF 61-G.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B584 C87850 dezincification resistant bronze with integral seat and threaded bonnet.
- d. Ends: Threaded or Solder.
- e. Stem: Lead free silicon bronze.
- f. Disc: Solid wedge, lead free bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron.

## 2.06 IRON GATE VALVES

A. Class 125, Ductile-Iron Resilient Wedge Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model F-619-RWS (NRS) or F-607-RWS (OS&Y) or a comparable product by one of the following:

- a. Clow
- b. Mueller

2. Description:

- a. Standard: AWWA C-509 and C-515,
- b. CWP Rating: 300 psig.
- c. Body Material: ASTM A536 ductile iron, fusion-bonded epoxy coating inside and out.

- d. Ends: Flanged.
- e. Trim: stainless steel.
- f. Disc: Rubber encapsulated ductile iron wedge.
- g. Packing and Gasket: Asbestos free.

## 2.07 MANUAL CIRCUIT BALANCING VALVES

### A. Bronze, Fixed Orifice, Balancing Valves (2" and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S-1810-LF or a comparable product by one of the following:
  - a. Or approved equal
2. Description:
  - a. CWP Rating: 300 psig
  - b. Maximum Operating Temperature: 260°F.
  - c. Body Material: Bronze or dezincification-resistant brass, lead free, Y-pattern globe type with fixed orifice (venture) for precise regulation and control. NO QUARTER TURN VALVES WILL BE ACCEPTED.
  - d. Plug: Bronze or dezincification-resistant brass with EPDM O-Rings.
  - e. Seat: Bronze or dezincification-resistant brass.
  - f. Ends: Threaded or Solder.
  - g. Pressure Gage Connections: Shall have two metering test ports with internal check and protective caps for use with portable differential pressure metering stations.
  - h. Handle Style: Calibrated hand wheel equipped with visual position readout and hidden memory stops for repeatable regulation and control.

### B. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves (2-1/2" and larger):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model F/G 737A or a comparable product by one of the following:
  - a. Tour & Andersson
2. Description:
  - a. CWP Rating: 240 psig
  - b. Maximum Operating Temperature: 250°F.
  - c. Body Material: Cast-iron or steel body, globe pattern with calibrated orifice. NO BUTTERFLY VALVES.
  - d. Stem Seals: EPDM O-Rings
  - e. Disc: EPDM coated cast-iron disc.
  - f. Seat: Bronze or dezincification brass.
  - g. Ends: Flanged or grooved.
  - h. Pressure Gage Connection: Integral seals for portable differential pressure meter.
  - i. Handle Style: Calibrated hand wheel equipped with visual position readout and concealed memory stops for repeatable regulation and control.

## 2.08 GAS SHUT-OFF COCKS:

### A. Gas Shut-Off Cocks, Above Grade (4" and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T-FP-600-A or a comparable product by one of the following:
  - a. Or approved equal.
2. Description:
  - a. Standard: MSS SP-110
  - b. CWP Rating: 600 psig.
  - c. SWP Rating: 150 psig.
  - d. Gas Rating: CSA certified and UL/FM listed.
  - e. Body Design: Two piece with threaded body pack nut design (no threaded stem designs allowed) with adjustable stem packing.
  - f. Body Material: Dezincification-resistant brass.
  - g. Seats: PTFE
  - h. Ball: Chrome-plated brass
  - i. Ends: Threaded
  - j. Port: Full

### B. Gas Shut-Off Cocks, Below Grade:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Nordstom "Poly-Gas" or comparable product by one of the following:
  - a. Or approved equal.
2. Description:
  - a. Standards: ASTM D-2513 and ANSI B16.40
  - b. Valve boxes: cast iron tops marked "GAS", high-impact heavy-duty ABS valve can as manufactured by C.O. Test Services-VALVCO, Inc. or equal.

## 2.09 LPG SHUT-OFF COCKS:

### A. LPG Shut-Off Cocks, Above Grade (3" and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T-585-70-UL (1/2" – 1") and T-580-70-UL (1-1/4" – 3") or a comparable product by one of the following:
  - a. Or approved equal.
2. Description:
  - a. Standard: MSS SP-110, CSA certified and UL/FM listed.
  - b. CWP Rating: 600 psig.
  - c. SWP Rating: 150 psig.

- d. Gas Rating: 250 psi non-shock LP gas per UL842.
- e. Body Design: Two piece with threaded body pack nut design (no threaded stem designs allowed) with adjustable stem packing.
- f. Body Material: Dezincification-resistant brass.
- g. Seats: PTFE
- h. Ball: Chrome-plated brass
- i. Ends: Threaded
- j. Port: Full port (1/2" – 1"), conventional port (1-1/4" – 3")

B. LPG Shut-Off Cocks, Below Grade:

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Nordstom "Poly-Gas" or comparable product by one of the following:
  - a. Or approved equal.
- 2. Description:
  - a. Standards: ASTM D-2513 and ANSI B16.40
  - b. Valve boxes: cast iron tops marked "GAS", high-impact heavy-duty ABS valve can as manufactured by C.O. Test Services-VALVCO, Inc. or equal.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### 3.02 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.

- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Check Valves: In horizontal or vertical position, between flanges.
  - 3. Lift Check Valves: With stem upright and plumb.

### 3.03 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball, butterfly valves.
  - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
  - 3. Throttling Service: Ball or Butterfly valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends.
  - 3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
  - 4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.

### 3.05 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
  - 1. Bronze Valves: Threaded ends.
  - 2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
  - 3. Bronze Lift Check Valves: Class 125, nonmetallic TFE disc.
  - 4. Bronze Swing Check Valves: Class 150, nonmetallic TFE disc.
  - 5. Bronze Gate Valves: Class 150, RS.
- B. Pipe NPS 2-1/2 and Larger:
  - 1. Ductile-Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.

END OF SECTION

section 22 05 29

hangers and supports for plumbing piping and equipment

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. Section Includes:

- 1. Metal pipe hangers and supports.
- 2. Trapeze pipe hangers.
- 3. Thermal-hanger shield inserts.
- 4. Fastener systems.

- B. Related Sections:

- 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.03 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
  - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.



#### 1.05 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

#### 1.06 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.07 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the

contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.08 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.09 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.10 PROTECTION

- B. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- C. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.11 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should

furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

## 1.12 SUBMITTAL DATA

### A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract

design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.13 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.14 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.15 RECORD DRAWINGS

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

#### 1.16 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

### PART 2 - PRODUCTS

#### 2.01 Pipe Supports: Unless otherwise indicated on the drawings, shall be as follows:

- A. The Contractor shall furnish and install all miscellaneous iron work including angles, channels, etc., required to appropriately support the various piping systems. Hanger spacing and location shall conform to 2016 California Plumbing Code Table 313.1.
- B. All horizontal runs of piping within the building to be supported from the structural framing with steel rods and split ring hangers, B-Line, Grinnell Company, Tolco, or approved equal. Steel rods shall be secured to overhead framing with side beam connectors. Where necessary, install angle iron between framing to accommodate hanger rods. Where several pipes are running together, Unistrut, B-Line or Powerstrut channels with clamps may be used in lieu of individual pipe hangers, and supported from

structure as herein specified. Submit test data for type of hanger supports to be provided. For support conditions other than specified herein, the Contractor shall submit method of support for approval prior to any installation.

C. Horizontal Piping Hangers and Supports:

1. General: Provide factory fabricated horizontal hangers and supports complying with one of the following MSS types listed to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
  - a. Adjustable Steel Clevis Hangers: (MSS Type 1.) B-Line B 3100
  - b. Adjustable Swivel Pipe Rings: (MSS Type 5) B-Line B3690

D. Vertical-Piping Clamps:

1. General: Provide factory fabricated vertical-piping clamps complying with the following types listed, to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
2. Two-Bolt Riser Clamps: (MSS Type 8) B-Line B3373

E. Hanger-Rod Attachments:

1. General: Provide factory fabricated hanger-rod attachments B-Line, Tolco or approved equal, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-58 and manufacturer's published product information. Select size of hanger-rod attachment to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
2. Side beam eye socket, Tolco Fig. #57 for rod sizes 3/8" dia. and Tolco Fig. #25-30-251 for rod sizes 1/2" dia.

F. Building Attachments:

1. General: Provide factory fabricated building attachments, selected by Installer to suit building structural framing conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

G. Hanger Rods and Spacing shall conform to the following table:

| <u>Pipe Sizes</u>    | <u>Spacing</u> | <u>Rods</u> |
|----------------------|----------------|-------------|
| 2 Inch and Smaller   | 6 Feet         | 3/8 Inch    |
| 2-1/2 Inch to 3 Inch | 8 Feet         | 1/2 Inch    |
| 4 Inch and larger    | 8 Feet         | 5/8 Inch    |

- H. Hangers and Supports shall be adequate to maintain alignment and prevent sagging and shall be placed within 18 inches of joint. Support shall be provided at each horizontal branch connection.
- I. Provide lateral bracing as manufactured by B-Line or approved equal for all piping to prevent swaying or movement in accordance with SMACNA "Guidelines for Seismic Restraints of Piping Systems". Piping smaller than indicated in the guidelines shall be provided with bracing as specified for the smallest size indicated. The entire water distribution system shall be properly braced and will not move due to the action of quick closing of valves.
- J. Miscellaneous Supports, Wall Brackets, Etc.: Provide where required in accordance with the best standard practices of the trade. Submit shop drawings for all fabricated supports.

## 2.02 ISOLATORS.

- A. All piping which is not isolated from contact with the building by its insulation shall be installed with a manufactured type isolator. Isolators shall be B-Line vibra clamp and cushion, Super Strut, Stoneman "Trisolator", or approved equal. Piping shall be installed and supported in a manner to provide for expansion without strains. Guides shall be properly installed to ensure this requirement.

## 2.03 SHIELDS:

- A. General: Provide shields at piping hangers and supports, factory-fabricated, for all insulated piping as manufactured by Pipeshields Incorporated or approved equal. Size shields for exact fit to mate with pipe insulation.
  - 1. Protection Shields: MSS Type 40; provide high density insert of same thickness of insulation or equal 100-psi average compressive strength, waterproofed calcium silicate, encased with a sheet metal shield. Insert and shield shall cover entire circumference of the pipe and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

## 2.04 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- B. Stainless-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

## 2.05 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

## 2.06 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ERICO International Corporation.
  2. PHS Industries, Inc.
  3. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
  4. Piping Technology & Products, Inc.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552 or Type II cellular glass with 100-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## 2.07 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.



## 2.08 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.01 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick 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.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. 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.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.

- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger 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.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
  - 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 allowed by ASME B31.9 for building services piping.
  - 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.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  - 3. 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.
  - 4. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
  - 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.02 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.03 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures 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 so contours of welded surfaces match adjacent contours.

#### 3.04 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

#### 3.05 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 a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

#### 3.06 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

- E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
  - 2. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
  - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
  - 3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  - 4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
  - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  - 5. C-Clamps (MSS Type 23): For structural shapes.
  - 6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  - 7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  - 8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  - Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

- 9. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  - 2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

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. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Valve tags.
  - 5. Warning tags.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained

from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.06 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.07 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

## 1.08 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

## 1.09 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

## 1.10 SUBMITTAL DATA

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.
- F. Submittal Requirements:



1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

G. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by

identification for plumbing equipment

side with product data sheets for the proposed substitution item within the submittal.

- 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
- b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

#### 1.11 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

#### 1.12 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.13 RECORD DRAWINGS (Also see General Conditions)

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

#### 1.14 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

### PART 2 - PRODUCTS

#### 2.01 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  - 3. Minimum Letter Size: 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.
  - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
  - 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.02 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 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.
- G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- H. Label Content: Include caution and warning information, plus emergency notification instructions.

## 2.03 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

#### 2.04 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
  1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
  1. Valve-tag schedule shall be included in operation and maintenance data.

#### 2.05 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
  1. Size: 3 by 5-1/4 inches minimum.
  2. Fasteners: Brass grommet and wire.
  3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  4. Color: Yellow background with black lettering.

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

#### 3.02 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

#### 3.03 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting."

- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.
  - 1. Identification Paint: Use for contrasting background.
  - 2. Stencil Paint: Use for pipe marking.
- C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed 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 inaccessible 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 labels.
- D. Pipe Label Color Schedule:
  - 1. Domestic Water Piping:
    - a. Background Color: White.
    - b. Letter Color: Black.
  - 2. Sanitary Waste and Storm Drainage Piping:
    - a. Background Color: White.
    - b. Letter Color: Black.

### 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; shutoff valves; faucets; convenience and lawn-watering hose connections; 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 subparagraphs:
  - 1. Valve-Tag Size and Shape:
    - a. Cold Water: 1-1/2 inches, round.
    - b. Hot Water: 1-1/2 inches, round.
  - 2. Valve-Tag Color:
    - a. Cold Water: Natural.

- b. Hot Water: Natural.

- 3. Letter Color:

- a. Cold Water: Black.

- b. Hot Water: Black.

### 3.05 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

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. Section includes insulating the following plumbing piping services:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.
  - 3. Supplies and drains for handicap-accessible lavatories and sinks.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained



from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.06 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.07 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

## 1.08 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

## 1.09 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

## 1.10 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
  - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

- b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
- 2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
- 3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
- 4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
- 5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

#### 1.11 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

#### 1.12 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

- C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

- 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

#### 1.13 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.14 RECORD DRAWINGS (Also see General Conditions)

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

#### 1.15 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

#### 1.16 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

## 1.17 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

## 1.18 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.01 INSULATION MATERIALS

- A. Hot Water Pipe Insulation: All hot water supply and return piping, except exposed connections to plumbing fixtures, flanges and unions shall be insulated with ASTM C547, Class I, "Johns-Manville" "Micro-Lock" 850-APT, Owens-Corning Fiberglass Corp., ASJ/SL-11 or approved equal, 1" thick for sizes up to 2" and 1-1/2" thick for sizes 2" and larger with "Johns-Manville" "Zeston" pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2016 CMC
  - 1. Exposed insulated piping in occupied areas and exposed outside the building shall be covered with Johns-Manville" "Zeston" 30-mil thick white PVC jacketing material per ASTM D1784 with "Johns-Manville" "Zeston" pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Jacketing shall comply with ASTM E84, and shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2016 CMC.
  - 2. Hot water piping below slab shall have insulation protected by a 10-mil thick polyethylene plastic sleeve sealed watertight with poly vinyl chloride tape.
- B. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

- D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- F. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- G. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Johns Manville; Micro-Lok.
    - b. Knauf Insulation; 1000-Degree Pipe Insulation.
    - c. Owens Corning; Fiberglas Pipe Insulation.
  - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- H. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Armacell LLC; Tubolit.
    - b. Nomaco Insulation; IMCOLOCK and NOMALOCK.
- I. Condensate Pipe Insulation: All condensate piping within the building shall be insulated with "Imcoa" "Imcolock"  $\frac{3}{4}$ " nominal wall thickness closed-cell insulation. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2016 CMC. All joints shall be mitered and secured with black duct tape.
- J. Indirect Waste Pipe Insulation: All indirect waste drains from refrigerated kitchen equipment shall be insulated with "Armacell" "Armaflex" insulating tape.
- K. All insulation shall be continuous through supports and hangers.
- L. All fixtures complying with the provisions of the Americans with Disabilities Act shall be provided with Prowrap insulation for exposed hot water pipe, tailpiece, and trap as manufactured by McGuire, and secured per manufacturers recommendations. No tape wrapping shall be permitted.

## 2.02 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    - b. Eagle Bridges - Marathon Industries; 225.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
  2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive 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."
- C. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-96.
    - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-33.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive 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."
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    - b. Eagle Bridges - Marathon Industries; 225.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive 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."
- E. PVC Jacket Adhesive: Compatible with PVC jacket.



1. Products: Subject to compliance with requirements, provide the following:
  - a. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive 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."

## 2.03 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. ABI, Ideal Tape Division; 428 AWF ASJ.
  - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
  - c. Compac Corporation; 104 and 105.
  - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. ABI, Ideal Tape Division; 370 White PVC tape.
  - b. Compac Corporation; 130.
  - c. Venture Tape; 1506 CW NS.
2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

## 2.04 SECUREMENTS

- A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

## 2.05 PROTECTIVE SHIELDING GUARDS

### A. Protective Shielding Pipe Covers,:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. McGuire Manufacturing.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Cleanouts.

### 3.04 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor

- insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
  2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.05 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with

insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.06 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

### 3.07 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.08 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.09 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.



B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/2 and Larger: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be the following:
  - a. McGuire pre-insulated trap and supply covers.

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. Section Includes:
  - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
  - 2. Encasement for piping.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

## 1.05 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

## 1.06 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

## 1.07 UTILITIES

- A. See Drawings for Points of Connection.
- B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.
- C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.
- D. Domestic Water: The Contractor shall be responsible for the domestic water service outside of the building within five feet (5') of the foundation, and within the building itself. See

Civil Engineer's plans for onsite domestic water system.

1.08 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.09 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

- A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

- a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
- 2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
  - 3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
  - 4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
  - 5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

#### 1.12 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

#### 1.13 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

#### 1.14 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then

only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of water service.
2. Do not interrupt water service without Architect's written permission.

## PART 2 - PRODUCTS

### 2.01 PIPING MATERIALS

- A. Piping within the building and above grade shall be Type "L" ASTM B88, hard drawn copper tubing with wrought copper sweat fittings ANSI B16.18 and B16.22.
- B. Mechanically formed tee connection: Form mechanically extracted collars in a continuous operation by drilling pilot hole and drawing out tube surface to form collar, having a height of not less than three times the thickness of tube wall. Adjustable collaring device shall ensure proper tolerance and complete uniformity of the joint. Notch and dimple joining branch tube in a single process to provide free flow where the branch tube penetrates the fitting. Braze joints. Tooling as manufactured by T-Drill or equal.
- C. Outdoor underground piping in sizes 2-1/2" and 3" shall be Type "L" ASTM B88, hard drawn copper as specified for water piping within the building. Piping 2" and smaller shall be Type "K" ASTM B88, hard drawn copper with wrought copper sweat fittings ANSI B16.18 and B16.22.
- D. Piping below the building floor shall be Type "K" soft annealed copper tubing with no fittings below the slab.

### 2.02 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- E. Copper Unions:
  1. MSS SP-123.
  2. Cast-copper-alloy, hexagonal-stock body.
  3. Ball-and-socket, metal-to-metal seating surfaces.
  4. Solder-joint or threaded ends.

## 2.03 PIPING JOINING MATERIALS

### A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

### B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

### C. Solder Filler Metals: ASTM B 32, lead-free alloys.

### D. Flux: ASTM B 813, water flushable.

### E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

## 2.04 ENCASEMENT FOR PIPING

### A. Standard: ASTM A 674 or AWWA C105/A21.5.

### B. Form: Sheet or tube.

### C. Color: natural.

## PART 3 - EXECUTION

## 3.01 EARTHWORK

- ### A.
- Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

## 3.02 PIPING INSTALLATION

- ### A.
- Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- ### B.
- Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- ### C.
- Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- ### D.
- Install shutoff valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in



Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install domestic water piping level without pitch and plumb.
- G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- H. 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.
- I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- J. Install piping to permit valve servicing.
- K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.
- N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."
- R. Corrosion Protection:
  - 1. The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. Slip the tube around the pipe, centering it to provide a 1-ft overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at each joint to facilitate installation of the poly-wrap. The bunched-up poly-wrap shall be pulled from the preceding length of pipe, slipped over the end of the new length of pipe, and secured in place with one circumferential turn of tape plus

enough overlap to assure firm adhesion. The end of the poly-wrap shall be slipped from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe and tape it in place. The loose wrapping on the barrel of the pipe shall be pulled snugly around the barrel of the pipe and excess material folded over the top of the pipe and the folds held in place by means of short strips of adhesive tape, at about 3 foot intervals along the pipe.

2. Rips, punctures or other damage to the tube shall be repaired with the adhesive tape or pieces of tube material secured with tape. Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.
3. Valves, tees, crosses and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice and secured with the adhesive tape.

### 3.03 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 pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread 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.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

### 3.04 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  1. Vertical Piping: MSS Type 8 or 42, clamps.
  2. Individual, Straight, Horizontal Piping Runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
  - D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
  - E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
    1. NPS 2 and Smaller: 72 inches with 3/8-inch rod.
    2. NPS 2-1/2 to NPS 3: 8 feet with 1/2-inch rod.
  - F. Install supports for vertical copper tubing every 10 feet.
  - G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

### 3.05 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.06 PIPE AND EQUIPMENT IDENTIFICATION

- A. Each operating and service line shut-off valve shall be identified by a 19 ga. brass tag with stamped, engraved type of service identified and area served, complete with hole and brass chain mounted on valve stem or handle. Tag shall be a minimum of one and one-half inch (1-1/2") in diameter.
- B. All piping systems shall be readily identifiable by appropriate labeling with the name of the piping contained. Such labeling shall be by means of metal tags, stenciling,

stamping, or with adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft and at least once in each room and each story traversed by the piping system.

- C. Provide on exterior wall of each building opposite the building's main gas service a sign reading "Gas Shut Off". Sign shall be metal with minimum 1-1/2" high-embossed letters.
  - 1. All equipment shall be provided with name plate indicating all pertinent information on it

### 3.07 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

- 1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
  - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

- 2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.08 ADJUSTING

- A. Perform the following adjustments before operation:
  - 1. Close drain valves, hydrants, and hose bibbs.
  - 2. Open shutoff valves to fully open position.
  - 3. Open throttling valves to proper setting.
  - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    - b. Adjust calibrated balancing valves to flows indicated.
  - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.09 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours. Operate all valves during the retention period.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours. Operate all valves during the retention period.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.

- e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

### 3.10 TESTING

- A. No piping work shall be concealed or covered until piping has been tested, inspected and approved by the Inspector. All piping for plumbing systems shall be completely installed and tested as required by the Uniform Plumbing Code. Test pressures and times indicated are a minimum only. All tests shall be as required by the governing authority as well.

### 3.11 OPERATION INSTRUCTION

- A. Prior to occupancy or prior to the date of final inspection, whichever may occur first, the Contractor shall prepare two (2) sets of typewritten instructions for the operation of all equipment, valves, etc., specified and furnished as a part of the work under this section, and shall assign a competent person, thoroughly familiar with the job, to demonstrate and instruct a representative of the Owner in the operation of the equipment. The time of said demonstration and instructions shall be arranged with the Owner's representative approximately one (1) week in advance. Verbal instructions shall include shut-off location of gas and water. The Contractor shall assemble all operation and maintenance data supplied by the manufacturers of the various pieces of equipment, all keys and special wrenches required to operate and service the equipment (including keys for yard boxes, gas stops and fixture stops), and all equipment warranties and deliver same to the representative of the Owner on date of said instructions.

### 3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:
  - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- F. Aboveground domestic water piping shall be the following:
  1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

### 3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

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. Section Includes:
  - 1. Temperature-actuated, water mixing valves.
  - 2. Hose bibbs.
  - 3. Water-hammer arresters.
  - 4. Trap-seal primer valves.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained



from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

#### 1.06 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.07 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

## 1.08 UTILITIES

- A. See Drawings for Points of Connection.
- B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.
- C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.
- D. Domestic Water: The Contractor shall be responsible for the domestic water service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite domestic water system.
- E. Domestic Water Service: The Contractor shall arrange with the serving utility company for the installation of all water meter assemblies and reduced pressure backflow devices, including the service mains and vaults, and all required appurtenances as indicated on the drawings and in accordance with serving utility standards and shall pay all costs incurred. All required capacity fees, frontage fees and inspections, shall be paid for by the Owner. Contractor shall provide necessary tap-in connections in water main for sterilizing of domestic water system. Contractor shall connect into the main water service line as indicated on the drawings. The installation shall be in accordance with the serving utility company's standards.

## 1.09 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

## 1.10 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

## 1.11 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

## 1.12 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
  - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
  - 3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
  - 4. To be valid, all submittals must:
    - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    - c. Include all pertinent construction, installation, performance and technical data.

- d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
  - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
  - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
- e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

**B. Substitution Requirements:**

- 1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
- 2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
- 3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
- 4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished

under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

#### 1.13 UNINSPECTED WORK

- C. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- D. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.14 RECORD DRAWINGS (Also see General Conditions)

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

#### 1.15 GUARANTEES (Also see General Conditions)

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

## 1.16 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

## PART 2 - PRODUCTS

### 2.01 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

### 2.02 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

### 2.03 MIXING VALVES

- A. Individual-Fixture, Water Tempering Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Symmons Industries, Inc.
    - b. Bradley.
  - 3. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
  - 4. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
  - 5. Body: Bronze body with corrosion-resistant interior components.
  - 6. Temperature Control: Adjustable.
  - 7. Inlets and Outlet: Threaded.
  - 8. Finish: Rough or chrome-plated bronze.
  - 9. Tempered-Water Setting: 110°F.
  - 10. Tempered-Water Design Flow Rate: 0.35 GPM.

### 2.04 HOSE BIBBS

- A. Hose Bibbs:
  - 1. Standard: ASME A112.18.1 for sediment faucets.
  - 2. Body Material: Bronze.
  - 3. Seat: Bronze, replaceable.
  - 4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
  - 5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
  - 6. Pressure Rating: 125 psig.

7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Include operating key with each operating-key hose bibb.

## 2.05 WATER-HAMMER ARRESTERS

### A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Precision Plumbing Products, Inc.
  - b. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

## 2.06 TRAP-SEAL PRIMER DEVICE

### A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. Precision Plumbing Products, Inc.
  - c. Sioux Chief Manufacturing Company, Inc.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install water-hammer arresters in water piping according to PDI-WH 201.
- B. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

### 3.02 ACCESS PANELS:

- A. Wall access panels shall be minimum 12" x 12" for concealed valves and other equipment unless otherwise specified or indicated. Ceiling access panels shall be 18" x 18" minimum. Access panels shall be located and positioned for ready access and service of equipment housed within. Where access panels are specified with keyed cylinder locks, all such locks shall be identically keyed.
  - 1. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-CL, drywall, stainless steel finish, cylinder lock.
  - 2. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.
  - 3. Wall, Fire Rated: Elmdor/Stoneman FR-SS-CL, fire rated, stainless steel finish, cylinder lock.
  - 4. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.
  - 5. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-AKL, drywall, stainless steel finish, allen key latch.
  - 6. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.
  - 7. Wall, Fire Rated: Elmdor/Stoneman FR-SS, fire rated, stainless steel finish, return latch.
  - 8. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

### 3.03 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

### 3.04 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
  - 1. Supply-type, trap-seal primer valves.
  - 2. Trap-seal primer systems.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."



3.05 FIELD QUALITY CONTROL

- A. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- B. Prepare test and inspection reports.

3.06 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

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. Section Includes:
  - 1. Pipes, tubes, and fittings.
  - 2. Piping specialties.
  - 3. Piping and tubing joining materials.
  - 4. Valves.
  - 5. Pressure regulators.
  - 6. Concrete bases.

1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.04 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

## 1.05 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

## 1.06 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
  - 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
  - 2. Service Regulators: 65 psig minimum unless otherwise indicated.
- B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

## 1.07 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the

contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.08 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.09 UTILITIES

- A. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.
- B. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.
- C. Gas Service and Meter Assembly: The Contractor shall arrange with the serving utility company for the installation of new gas service with complete meter assembly of the capacity indicated and in the location as shown on the drawings. All items served with gas shall be operated at full fire and adjusted by the Contractor. In cooperation with gas utility, make all required adjustments to main gas pressure regulators. The Owner shall pay for all required fees.
- D. Gas Service and Meter Assembly: The Contractor shall arrange with the serving utility company to verify if the existing gas service and meter is adequate for the new addition gas load. If the contractor verifies if the service and meter is not adequate, he shall notify the Architect immediately in writing.

#### 1.10 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.11 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps

or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.12 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

#### 1.13 SUBMITTAL DATA

- A. Product Data: For each type of the following:
  - 1. Piping specialties.
  - 2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
  - 3. Pressure regulators. Indicate pressure ratings and capacities.
  - 4. Dielectric fittings.
- B. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
  - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

C. Substitution Requirements:

1. Product Data: For each type of the following:
  - a. Piping specialties.
  - b. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
  - c. Pressure regulators. Indicate pressure ratings and capacities.
  - d. Dielectric fittings.
2. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by

side with product data sheets for the proposed substitution item within the submittal.

- 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
- b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
3. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
4. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
5. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
6. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

#### 1.14 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. 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.

#### 1.15 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
- D. Protect stored PE pipes and valves from direct sunlight.

#### 1.16 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
  - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of natural-gas service.
  - 2. Do not proceed with interruption of natural-gas service without Construction Manager's written permission.

#### 1.17 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

### PART 2 - PRODUCTS

#### 2.01 Gas Piping:

- A. Concealed gas piping within the building shall be Schedule 40 black steel pipe conforming to ASTM A-53 using 150 pound banded malleable iron screwed fittings for piping 2" and smaller and weld type steel fittings for piping 2-1/2" and larger.
- B. Exposed gas piping outside the building shall be Schedule 40 galvanized steel pipe conforming to ASTM A-53 using galvanized 150 pound banded galvanized malleable iron screwed fittings for piping in sizes 2" and smaller and seamless weld type steel fittings for all piping in sizes 2-1/2" and larger.
- C. Underground gas piping shall be SDR-11 Polyethylene PE2406 (Yellow) as manufactured by Driscoplex. Fittings shall be socket fusion weld Polyethylene as manufactured by Performance Pipe or Central, PE2406 (Yellow) complying with ASTM, D2513. Where required provide "Lyco" or Double "O" seal transition fittings between steel and polyethylene as manufactured by Central, all identified and approved for gas service. A 14 gauge copper tracer wire shall be installed with and attached to piping and shall terminate above grade at each end. Underground polyethylene piping shall be installed by personnel certified by the pipe manufacturer as having received instructions directly



from the pipe manufacturer's field representative. Contractors not having certified personnel will be required to have a factory representative of the pipe manufacturer visit the site at the time of underground pipe installation and provide the required instructions. All required cost for training and certification shall be paid for by Contractor.

1. Upon completion of the gas piping underground installation, Contractor shall submit a written report directly to the Architect stating that all materials installed are as specified and approved, and that installation was performed by factory certified personnel and tested to 60 P.S.I.
2. All piping on roof shall be supported by pipe supports as manufactured by MAPA Products. Products by Miro Industries and Erico shall be accepted for submittal review.
  - a. Pressurized Piping:
    - 1) For pipe sizes 1" and less: MS-1 single post, adjustable height pipe support.
    - 2) For pipe sizes 2 ½" and less: MS-4 adjustable, roller pipe support.
    - 3) For pipe sizes 4" and less: MS-5 adjustable, roller pipe support.
  - b. Gravity System Piping 2" and Less: MS-1 single post, adjustable height pipe support.
3. All piping on roof shall be anchored to 4" x 4" redwood blocking with pipe straps. Blocking shall be set in mastic at 6'-0" on center
4. All underground non-metallic piping shall have 14 gauge copper "Tracer Wire" continuous for entire length.

## 2.02 PIPES, TUBES, AND FITTINGS

### A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
  - a. Material Group: 1.1.
  - b. End Connections: Threaded or butt welding to match pipe.
  - c. Lapped Face: Not permitted underground.
  - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
  - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

f. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
  - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
  - b. Aboveground Portion: PE transition fitting.
  - c. Outlet shall be threaded or flanged or suitable for welded connection.
  - d. Tracer wire connection.
  - e. Ultraviolet shield.
  - f. Stake supports with factory finish to match steel pipe casing or carrier pipe.
4. Transition Service-Line Risers: Factory fabricated and leak tested.
  - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
  - b. Outlet shall be threaded or flanged or suitable for welded connection.
  - c. Bridging sleeve over mechanical coupling.
  - d. Factory-connected anode.
  - e. Tracer wire connection.
  - f. Ultraviolet shield.
  - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
5. Plastic Mechanical Couplings, NPS 1-1/2 and Smaller: Capable of joining PE pipe to PE pipe.
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Lyall, R. W. & Company, Inc.
    - 2) Mueller Co.; Gas Products Div.
    - 3) Perfection Corporation; a subsidiary of American Meter Company.
  - b. PE body with molded-in, stainless-steel support ring.
  - c. Buna-nitrile seals.
  - d. Acetal collets.
  - e. Electro-zinc-plated steel stiffener.
6. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Dresser Piping Specialties; Division of Dresser, Inc.

2) Smith-Blair, Inc.

- b. Stainless-steel flanges and tube with epoxy finish.
- c. Buna-nitrile seals.
- d. Stainless-steel bolts, washers, and nuts.
- e. Factory-installed anode for steel-body couplings installed underground.

2.03 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

- 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
- 2. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
- 3. Corrugated stainless-steel tubing with polymer coating.
- 4. Operating-Pressure Rating: 0.5 psig.
- 5. End Fittings: Zinc-coated steel.
- 6. Threaded Ends: Comply with ASME B1.20.1.

A. Y-Pattern Strainers:

- 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
- 3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
- 4. CWP Rating: 125 psig.

B. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.04 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.05 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
  2. Threaded Ends: Comply with ASME B1.20.1.
  3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
  4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
  6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
1. CWP Rating: 125 psig.
  2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
  3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
- D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. McDonald, A. Y. Mfg. Co.
    - b. Nibco.
  2. Body: Bronze, complying with ASTM B 584.
  3. Ball: Chrome-plated bronze.
  4. Stem: Bronze; blowout proof.
  5. Seats: Reinforced TFE; blowout proof.
  6. Packing: Threaded-body packnut design with adjustable-stem packing.
  7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  8. CWP Rating: 600 psig.
  9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
  10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- E. Bronze Plug Valves: MSS SP-78.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Lee Brass Company.
    - b. McDonald, A. Y. Mfg. Co.
  2. Body: Bronze, complying with ASTM B 584.
  3. Plug: Bronze.

4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. PE Ball Valves: Comply with ASME B16.40.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Kerotest Manufacturing Corp.
  - b. Lyall, R. W. & Company, Inc.
  - c. Perfection Corporation; a subsidiary of American Meter Company.
2. Body: PE.
3. Ball: PE.
4. Stem: Acetal.
5. Seats and Seals: Nitrile.
6. Ends: Plain or fusible to match piping.
7. CWP Rating: 80 psig.
8. Operating Temperature: Minus 20 to plus 140 deg F.
9. Operator: Nut or flat head for key operation.
10. Include plastic valve extension.

G. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

## 2.06 EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Pacific Seismic Products, Inc.
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Maximum Operating Pressure: 0.5 psig.
4. Cast-aluminum body with stainless-steel internal parts.
5. Nitrile-rubber, reset-stem o-ring seal.
6. Valve position, open or closed, indicator.
7. Composition valve seat with clapper held by spring or magnet locking mechanism.

8. Level indicator.
9. End Connections: Threaded for valves NPS 2 and smaller; flanged for valves NPS 2-1/2 and larger.

## 2.07 PRESSURE REGULATORS

### A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

### B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Meter Company.
  - b. Fisher Control Valves and Regulators; Division of Emerson Process Management.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 5psig.

## 2.08 Access Panels:

- A. Wall access panels shall be minimum 12" x 12" for concealed valves and other equipment unless otherwise specified or indicated. Ceiling access panels shall be 18" x 18" minimum. Access panels shall be located and positioned for ready access and service of equipment housed within. Where access panels are specified with keyed cylinder locks, all such locks shall be identically keyed.
  1. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-CL, drywall, stainless steel finish, cylinder lock.
  2. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.

3. Wall, Fire Rated: Elmdor/Stoneman FR-SS-CL, fire rated, stainless steel finish, cylinder lock.
4. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.
5. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-AKL, drywall, stainless steel finish, allen key latch.
6. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.
7. Wall, Fire Rated: Elmdor/Stoneman FR-SS, fire rated, stainless steel finish, return latch.
8. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

#### 2.09 Kitchen Equipment & Fixtures:

- A. The Plumbing Contractor shall run all service lines, rough-in and make final connections to all equipment provided by Kitchen Equipment Contractor. The work shall include installing and connecting of all piping within equipment, through, under or along the backs of working surfaces as required and indicated by equipment manufacturer, Plumbing Contractor shall furnish and install all gas cocks as required for Kitchen Equipment furnished equipment. The Contractor shall also furnish and install equipment as indicated on plumbing drawings complete with all required trim including cocks. All exposed piping and fittings shall be chrome plated.

#### 2.10 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

- C. Comply with NFPA 54 requirements for prevention of accidental ignition.

### 3.03 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 for installation and purging of natural-gas piping.
- B. Install underground, PE, natural-gas piping according to ASTM D 2774.
- C. Steel Piping with Protective Coating:
  - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
  - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
  - 3. Replace pipe having damaged PE coating with new pipe.
- D. Install fittings for changes in direction and branch connections.

### 3.04 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. 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.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Verify final equipment locations for roughing-in.
- K. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.



- L. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
  - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- M. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- O. Concealed Location Installations:
  - 1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
  - 2. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
    - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
  - 3. Prohibited Locations:
    - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    - b. Do not install natural-gas piping in solid walls or partitions.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.
- R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- S. Do not use natural-gas piping as grounding electrode.
- T. Install strainer on inlet of each line-pressure regulator.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.05 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.

### 3.06 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
  - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
  - 2. Cut threads full and clean using sharp dies.
  - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
  - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
  - 5. 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.
- D. Welded Joints:
  - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
  - 2. Bevel plain ends of steel pipe.
  - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
- F. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

### 3.07 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 2 and Smaller: Maximum span, 6 feet; minimum rod size, 3/8 inch.
  - 2. NPS 2-1/2 to NPS 3-1/2: Maximum span, 8 feet; minimum rod size, 1/2 inch.

### 3.08 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install piping adjacent to appliances to allow service and maintenance of appliances.
- C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### 3.09 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for piping and valve identification.
- B. Each operating and service line shut-off valve shall be identified by a 19 ga. brass tag with stamped, engraved type of service identified and area served, complete with hole and brass chain mounted on valve stem or handle. Tag shall be a minimum of one and one-half inch (1-1/2") in diameter.
- C. All piping systems shall be readily identifiable by appropriate labeling with the name of the piping contained. Such labeling shall be by means of metal tags, stenciling, stamping, or with adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft and at least once in each room and each story traversed by the piping system.
- D. Provide on exterior wall of each building opposite the building's main gas service a sign reading "Gas Shut Off". Sign shall be metal with minimum 1-1/2" high-embossed letters.
- E. All equipment shall be provided with name plate indicating all pertinent information on it

### 3.10 PAINTING

- A. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
  - 1. Alkyd System: MPI EXT 5.1D.
    - a. Prime Coat: Alkyd anticorrosive metal primer.
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.

- c. Topcoat: Exterior alkyd enamel flat.
    - d. Color: Gray.
  - B. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.
- 3.11 FIELD QUALITY CONTROL
- A. Perform tests and inspections.
    - 1. No piping work shall be concealed or covered until piping has been tested, inspected and approved by the Inspector. All piping for plumbing systems shall be completely installed and tested as required by the Uniform Plumbing Code. Test pressures and times indicated are a minimum only. All tests shall be as required by the governing authority as well.
  - B. Tests and Inspections:
    - 1. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.
  - C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
  - D. Prepare test and inspection reports.
- 3.12 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.
- 3.13 OUTDOOR PIPING SCHEDULE
- A. Underground natural-gas piping shall be:
    - 1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.
  - B. Aboveground natural-gas piping in exposed locations shall be one of the following:
    - 1. Galvanized steel pipe with galvanized steel malleable-iron fittings and threaded joints.
    - 2. Galvanized steel pipe with galvanized wrought-steel fittings and welded joints.
- 3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG
- A. Aboveground piping NPS 2 and smaller shall be the following:
    - 1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground piping NPS 2-1/2 and larger shall be the following:

1. Steel pipe with wrought-steel fittings and welded joints.

### 3.15 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Piping valves shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

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. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.
  - 3. Encasement for underground metal piping.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained

from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

#### 1.06 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.07 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

## 1.08 UTILITIES

- A. See Drawings for Points of Connection.
- B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.
- C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.
- D. Sanitary Sewer: The Contractor shall be responsible for the soil and waste piping outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite sewer system.
- E. Sanitary Sewer: The Contractor shall be responsible for the soil and waste piping inside and outside of the buildings. See Civil Engineer's plans for connection into the sanitary sewer street main or lateral to property as indicated on drawings.
- F. Sanitary Sewer: The Contractor shall be responsible for all costs incurred in connecting into the sanitary sewer street main or lateral to property as indicated on the drawings, with the exception that all required frontage fees, capacity fees and inspections shall be paid for by the Owner. The installation shall be in accordance with the serving utility company's standards.

## 1.09 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

## 1.10 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.



## 1.11 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

## 1.12 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
  - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
  - 3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
  - 4. To be valid, all submittals must:
    - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
    - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
    - c. Include all pertinent construction, installation, performance and technical data.
    - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

- 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
  - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
- e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without

proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

#### 1.13 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, 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. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

#### 1.14 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

#### 1.15 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
  2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

#### 1.16 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.17 RECORD DRAWINGS (Also see General Conditions)

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.18 GUARANTEES (Also see General Conditions)

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.02 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Solvent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
- C. ASTM C 1540, CISPI, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ANACO-Husky SD 4000 series.
    - b. IDEAL-Tridon HD Series Heavy Duty
  - 2. Standards: ASTM C 1277 and CISPI 310.

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
4. All above ground vent pipe fittings may be made with "ANACO" or "IDEAL-Tridon Domestic" stainless steel two hand couplings conforming to CISPI Standard 310.

## PART 3 - EXECUTION

### 3.01 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

### 3.02 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 coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. 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.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
  - 1. Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  - 2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- O. Plumbing Specialties:
  - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
  - 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."
- T. Below-grade piping through exterior walls shall be sealed using Link Seal modular seal with nitrile seal elements and stainless steel bolts and sleeves as manufactured by Century Line.
- U. Corrosion Protection:
  - 1. The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. Slip the tube around the pipe, centering it to provide a 1-ft overlap on each adjacent pipe section, and bunching it accordion fashion

lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at each joint to facilitate installation of the polywrap. The bunched-up polywrap shall be pulled from the preceding length of pipe, slipped over the end of the new length of pipe, and secured in place with one circumferential turn of tape plus enough overlap to assure firm adhesion. The end of the polywrap shall be slipped from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe and tape it in place. The loose wrapping on the barrel of the pipe shall be pulled snugly around the barrel of the pipe and excess material folded over the top of the pipe and the folds held in place by means of short strips of adhesive tape, at about 3 foot intervals along the pipe.

2. Rips, punctures or other damage to the tube shall be repaired with the adhesive tape or pieces of tube material secured with tape. Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.
3. Valves, tees, crosses and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice and secured with the adhesive tape.

### 3.03 JOINT CONSTRUCTION

- A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. Threaded Joints: Thread 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.

### 3.04 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
  3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
  5. Vertical Piping: MSS Type 8 or Type 42, clamps.
  6. Install individual, straight, horizontal piping runs:

- a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
  - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
  - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
- 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  - 2. NPS 3: 60 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
  - 4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4: 84 inches with 3/8-inch rod.
  - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
  - 3. NPS 2: 10 feet with 3/8-inch rod.
  - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
  - 5. NPS 3: 12 feet with 1/2-inch rod.
  - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.05 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.



3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

### 3.06 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.07 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure

must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

### 3.08 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

### 3.09 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping shall be the following:
  1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
- C. Aboveground, vent piping shall be the following:
  1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
- D. Underground, soil, waste, and vent piping shall be the following:
  1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

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. Section Includes:
  - 1. Cleanouts.
  - 2. Floor drains.
  - 3. Miscellaneous sanitary drainage piping specialties.

1.03 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FOG: Fats, oils, and greases.
- C. HDPE: High-density polyethylene plastic.

1.04 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.05 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.

- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.06 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

Revise pressure ratings in two subparagraphs below to suit Project. Coordinate with Section 221319 "Sanitary Waste Piping Specialties." Soil and waste piping may require higher rating if used in high-rise buildings.

1. Soil, Waste, and Vent Piping: 10-foot head of water.

Retain paragraph below with "Seismic Qualification Certificates" Paragraph in "Informational Submittals" Article for Projects requiring seismic design. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Verify requirements of authorities having jurisdiction.

2. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

#### 1.07 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.08 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.09 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.10 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.11 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

#### 1.12 SUBMITTAL DATA

##### A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

##### B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be

accepted for review, and the Contractor shall submit all items as specified or shown on plans.

- a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
  3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
  4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
  5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

#### 1.13 INFORMATIONAL SUBMITTALS

- A. Manufacturer Seismic Qualification Certification: Submit certification that grease interceptors, accessories, and components will withstand seismic forces defined in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Include the following:
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. 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."
    - b. 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."
  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.

- B. Field quality-control reports.

#### 1.14 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

#### 1.15 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- 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 NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

#### 1.16 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.17 RECORD DRAWINGS (Also see General Conditions)

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

#### 1.18 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.



- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

#### 1.19 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate size and location of roof penetrations.

#### 1.20 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Cultures: Provide 1-gal. bottles of bacteria culture recommended by manufacturer of FOG disposal systems equal to 200 percent of amount installed, but no fewer than 2 1-gal. bottles.

### PART 2 - PRODUCTS

#### 2.01 CLEANOUTS

- A. Exposed Metal Cleanouts:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Zurn
    - b. JR Smith
    - c. Watts
  - 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
  - 3. Size: Same as connected drainage piping
  - 4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
  - 5. Closure: Countersunk, brass plug.
  - 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Metal Floor Cleanouts:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Zurn
    - b. JR Smith
    - c. Watts

2. Standard: ASME A112.36.2M for cast-iron soil pipe with cast-iron ferrule threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Cast-iron soil pipe with cast-iron ferrule Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Outlet Connection: Threaded.
7. Closure: Brass plug with tapered threads.
8. Adjustable Housing Material: Cast iron with set-screws or other device.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Zurn
  - b. JR Smith
  - c. Watts
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Option for drilled-and-threaded plug in first subparagraph below is for a screw for a wall cover plate.
6. Closure: Countersunk, brass plug.
7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
8. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
9. Wall Access: stainless-steel wall-installation frame and cover.

## 2.02 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Zurn
  - b. JR Smith
  - c. Watts
3. Standard: ASME A112.6.3.
4. Pattern: Floor drain.
5. Body Material: Gray iron.
6. Seepage Flange: Required.
7. Anchor Flange: Required.
8. Clamping Device: Required.
9. Outlet: Bottom.
10. Coating in first subparagraph below is usually used only on sanitary floor drains.
11. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
12. Sediment Bucket: Not required.
13. Top or Strainer Material: Nickel bronze.

14. Top of Body and Strainer Finish: Nickel bronze.
15. Top Shape: Round.

## 2.03 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Vent Caps:
  1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
  2. Size: Same as connected stack vent or vent stack.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  2. Locate at each change in direction of piping greater than 45 degrees.
  3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
  4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  1. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  2. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- G. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
- H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
  1. Exception: Fitting may be omitted if trap has trap-seal primer connection.

2. Size: Same as floor drain inlet.

- I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- J. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- K. Install vent caps on each vent pipe passing through roof.
- L. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- M. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- N. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- O. Install wood-blocking reinforcement for wall-mounting-type specialties.
- P. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

### 3.02 CONNECTIONS

- A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

### 3.03 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
  - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
  - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
  - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
  - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

- 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07 62 00 "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

### 3.03 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

### 3.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.05 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

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. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Single-Wall Piping Pressure Rating: 10-foot head of water.
- B. Delegated Design: Design seismic restraints for aboveground piping, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

#### 1.06 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.07 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.08 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the

contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.09 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.10 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

#### 1.11 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
  - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the



work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the

corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

- b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

#### 1.12 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, 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. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

#### 1.13 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.14 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
  - 2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

1.15 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.16 RECORD DRAWINGS (Also see General Conditions)

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.17 GUARANTEES (Also see General Conditions)

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

## PART 2 - PRODUCTS

### 2.01 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Indirect Waste Piping.
  - 1. Shall be Type "L" copper as specified for water piping.
- C. Air Conditioning Condensate Drain Piping.
  - 1. Shall be Type "M" copper as specified for water piping.
- D. High Efficiency Furnace Condensate Drain Piping.
  - 1. CPVC plastic piping, SDR 13.5, ASTM F 442, UL listed. Install piping per manufacturer's recommendation.

### 2.02 COPPER TUBE AND FITTINGS:

- A. Hard Copper Tube: ASTM B 88, Type M tube, drawn temper.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- C. Copper Unions:
  - 1. MSS SP-123.
  - 2. Cast-copper-alloy, hexagonal-stock body.
  - 3. Ball-and-socket, metal-to-metal seating surfaces.
  - 4. Solder-joint or threaded ends

### 2.03 SPECIALTY PIPE FITTINGS

- A. Dielectric Fittings:
  - 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
  - 2. Dielectric Unions:
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) Wilkins; a Zurn company.
    - b. Description:
      - 1) Standard: ASSE 1079.

- 2) Pressure Rating: 150 psig.
- 3) End Connections: Solder-joint copper alloy and threaded ferrous.

## PART 3 - EXECUTION

### 3.01 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of condensate drain piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install condensate drain piping with 1 percent slope downward toward drain.
- 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 at indicated slopes.
- G. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Install unions in copper tubing at connection to each piece of equipment, machine, and specialty.
- L. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- M. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

- P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.02 JOINT CONSTRUCTION

- A. Threaded Joints: Thread 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.
- B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

### 3.03 SPECIALTY PIPE FITTING INSTALLATION

- A. Dielectric Fittings:
  - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
  - 2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

### 3.04 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  - 1. Vertical Piping: MSS Type 8 or 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers
  - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 6. Install individual, straight, horizontal piping runs:

- a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
  - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
  - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
- 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4 and Smaller: 72 inches with 3/8-inch rod.
  - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.05 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect drainage and vent piping to the following:
  - 1. Plumbing Specialties: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Install test tees (wall cleanouts) in conductors near floor.
  - 3. Equipment: Connect drainage piping as indicated. Provide union for each connection.
- C. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- D. Make connections according to the following unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

### 3.06 IDENTIFICATION

- A. Identify exposed condensate drain piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.07 FIELD QUALITY CONTROL

#### A. Perform the following tests and inspections:

##### 1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
  - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

##### 2. Piping Tests:

- a. Fill condensate drain piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

#### B. Condensate drain piping will be considered defective if it does not pass tests and inspections

#### C. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

#### D. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.



### 3.08 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

### 3.09 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, condensate drain piping NPS 2 and smaller, shall be the following:
  - 1. Hard copper tube, ASTM B 88, Type M copper, solder-joint fittings; and soldered joints.

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. Section Includes:
  - 1. Water closets.
  - 2. Flushometer valves.
  - 3. Toilet seats.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
  - 9. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.
  - 10. All single-user toilet facilities shall be identified as a Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.2.6.3. no

pictogram, text or braille is required on the symbol. If a tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are "ALL-GENER RESTROOM", "RESTROOM", OR "UNISEX RESTROOM". DSA BU 17-01.

11. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.
12. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1.
13. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
14. Accessible fixture controls shall comply with CBC Sections 11B-604.6 for water closets and 11B-604.9.5 for children's water closets.

- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.06 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.07 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.08 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.09 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

## 1.10 SUBMITTAL DATA

### A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

### B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be

accepted for review, and the Contractor shall submit all items as specified or shown on plans.

- a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
  3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
  4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
  5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
  6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

#### 1.11 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
  1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

## 1.12 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

## 1.13 RECORD DRAWINGS (Also see General Conditions)

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

## 1.14 GUARANTEES (Also see General Conditions)

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

## PART 2 - PRODUCTS

### 2.01 EQUIPMENT AND FIXTURES:

- A. Fixtures:
  - 1. See schedule on drawings.

### 2.02 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

- A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. American Standard America.
  - b. Kohler Co.
3. Bowl:
  - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
  - b. Material: Vitreous china.
  - c. Type: Siphon jet.
  - d. Style: Flushometer valve.
  - e. Height: Standard.
  - f. Rim Contour: Elongated.
  - g. Water Consumption: 1.28 gal. (4.8 L) per flush.
  - h. Spud Size and Location: NPS 1-1/2 (DN 40); top.

## 2.03 FUSHOMETER VALVES

### A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Sloan Valve Company.
3. Standard: ASSE 1037.
4. Minimum Pressure Rating: 125 psig (860 kPa).
5. Features: Include integral check stop and backflow-prevention device.
6. Material: Brass body with corrosion-resistant components.
7. Exposed Flushometer-Valve Finish: Chrome plated.
8. Panel Finish: Chrome plated or stainless steel.
9. Style: Exposed.
10. Consumption: 1.28 gal. (4.8 L) per flush.
11. Minimum Inlet: NPS 1 (DN 25).
12. Minimum Outlet: NPS 1-1/4 (DN 32).

## 2.04 TOILET SEATS

### A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Bemis Manufacturing Company.



- b. Olsonite Seat Co.
- 3. Standard: IAPMO/ANSI Z124.5.
- 4. Material: Plastic.
- 5. Type: Commercial (Standard).
- 6. Shape: Elongated rim, open front.
- 7. Hinge: Self-sustaining, check.
- 8. Hinge Material: Noncorroding metal.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.
- B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

### 3.02 INSTALLATION

- A. Water-Closet Installation:
  - 1. Install level and plumb according to roughing-in drawings.
  - 2. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
  - 1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
  - 2. Use carrier supports with waste-fitting assembly and seal.
  - 3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- C. Flushometer-Valve Installation:
  - 1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
  - 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.

3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
- D. Install toilet seats on water closets.
- E. Wall Flange and Escutcheon Installation:
1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
  2. Install deep-pattern escutcheons if required to conceal protruding fittings.
  3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- F. Joint Sealing:
1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
  2. Match sealant color to water-closet color.
  3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

### 3.03 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

### 3.04 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

### 3.05 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.

- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

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. Section Includes:
  - 1. Lavatories.
  - 2. Faucets.

1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
  - 9. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.
  - 10. All single-user toilet facilities shall be identified as a Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.2.6.3. no pictogram, text or braille is required on the symbol. If a tactile jamb signage is

provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are "ALL-GENER RESTROOM", "RESTROOM", OR "UNISEX RESTROOM". DSA BU 17-01.

11. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.
  12. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
  13. Accessible fixture controls shall comply with CBC Sections 11B-611.3 for lavatories and sinks.
  14. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34" maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC 11B-306 when forward approach is required CBC Sections 11B-606.3 and 11B-606.7.
  15. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories or sinks. CBC Section 11B-606.5.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.06 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.07 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.08 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.09 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

## 1.10 SUBMITTAL DATA

### A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

### B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be

accepted for review, and the Contractor shall submit all items as specified or shown on plans.

- a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
  3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
  4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
  5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
  6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

#### 1.11 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

#### 1.12 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.



- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

#### 1.13 RECORD DRAWINGS (Also see General Conditions)

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

#### 1.14 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

### PART 2 - PRODUCTS

#### 2.01 Equipment and Fixtures:

- A. Fixtures:
  - 1. See schedule on drawings.

#### 2.02 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

- A. Lavatory: Vitreous china, wall mounted, with back.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard America.
    - b. Kohler Co.
  - 2. Fixture:

- a. Standard: ASME A112.19.2/CSA B45.1.
  - b. Type: For wall hanging.
  - c. Faucet-Hole Location: Top.
  - d. Color: White.
  - e. Mounting Material: Chair carrier.
3. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

## 2.03 SOLID-BRASS, MANUALLY OPERATED FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Lavatory Faucets: Manual-type, single-control mixing, commercial, solid-brass valve.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Chicago Faucets.
  - 3. Standard: ASME A112.18.1/CSA B125.1.
  - 4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
  - 5. Body Material: Commercial, solid brass.
  - 6. Finish: Polished chrome plate.
  - 7. Mounting Type: Deck, exposed.

## 2.04 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Chicago
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Chicago
- E. Operation: Loose key.
- F. Risers:
1. NPS 3/8.
  2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces riser.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.
- B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

### 3.02 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.
- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."
- G. Point of use mixing valve in cabinet to be recessed in wall, under lavatory.

### 3.03 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

### 3.04 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

### 3.05 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

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. Section Includes:
  - 1. Sinks
  - 2. Sink faucets.

### 1.03 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

### 1.04 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
  - 9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.
  - 10. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
  - 11. Accessible fixture controls shall comply with CBC Sections 11B-611.3 for lavatories and sinks.

12. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34" maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC 11B-306 when forward approach is required CBC Sections 11B-606.3 and 11B-606.7.
  13. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories or sinks. CBC Section 11B-606.5.
- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.05 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.06 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.07 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.08 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.09 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

#### 1.10 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices.

Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

**B. Substitution Requirements:**

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.



- 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

#### 1.11 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

#### 1.12 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

## 1.13 RECORD DRAWINGS

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

## 1.010 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

## PART 2 - PRODUCTS

### 2.01 EQUIPMENT AND FIXTURES:

- A. Fixtures:
  - 1. See schedule on drawings.

### 2.02 SINKS

- A. Utility Sinks: Stainless steel, counter mounted.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Elkay Manufacturing Co.
    - b. Just Manufacturing.
  - 3. Fixture:
    - a. Standard: ASME A112.19.3/CSA B45.4.
    - b. Type: Ledge back.

- c. Number of Compartments: One
- d. Overall Dimensions: 22 by 19 inches
- e. Metal Thickness: 0.050 inch
- f. Compartment:
  - 1) Dimensions: See Plumbing Fixture Schedule
  - 2) Drain: Grid with NPS 1-1/2 tailpiece with stopper
  - 3) Drain Location: Centered in compartment.

4. Faucet(s): See Plumbing Fixture Schedule

- a. Number Required: One.
- b. Mounting: On ledge.

## 2.03 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual Type, Push Button.

1. Commercial, Solid-Brass Faucets.

- a. Manufacturers: Subject to compliance with requirements, provide products by the following:
- b. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following

1) Chicago Faucets.

- 2. Standard: ASME A112.18.1/CSA B125.1.
- 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
- 4. Body Material: Commercial, solid brass.
- 5. Finish: Chrome plated.
- 6. Maximum Flow Rate:

- a. Sinks: 1.5 gpm.

- 7. Mounting Type: Counter mounted.
- 8. Vacuum Breaker: Required for hose outlet.
- 9. Spout Outlet: Hose thread according to ASME B1.20.7.

## 2.04 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Chicago
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Chicago
- E. Operation: Loose Key.

#### 2.05 SINK WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.
- C. Trap:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. McGuire MFG.
  - 3. Size: NPS 1-1/2.
  - 4. Material: Chrome-plated, seamless prewrapped cast-brass trap and swivel elbow, and chrome-plated brass or steel wall flange.

#### 2.06 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.
- B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

### 3.02 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
  - 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."
  - 2. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

### 3.03 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

### 3.04 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

### 3.05 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

### 3.06 COMPLETION OF INSTALLATION:

- A. Cleaning and Flushing: Clean all equipment and materials thoroughly. Leave surface to be painted smooth and clean, ready for painting.
- B. Flush each unit of water supply and distribution system thoroughly with clean water at the highest velocities attainable.
- C. Clean all piping, valves, traps, water heaters, fixtures and other devices thoroughly and flush or blow out until free of scale, oil silt, sand, sediment, pipe dope and foreign matter of any kind.

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. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Mechanical sleeve seals.
  - 3. Sleeves.
  - 4. Escutcheons.
  - 5. Grout.
  - 6. HVAC demolition.
  - 7. Equipment installation requirements common to equipment sections.
  - 8. Painting and finishing.
  - 9. Concrete bases.
  - 10. Supports and anchorages.

### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. CPVC: Chlorinated polyvinyl chloride plastic.
  - 2. PE: Polyethylene plastic.

3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Escutcheons.

B. Welding certificates.

#### 1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### 1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.



- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## 2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Plastic. Include two for each sealing element.
  - 4. 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.

## 2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set screws.

## 2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated.

- C. One-Piece, Floor-Plate Type: Cast-iron floor plate.

## 2.7 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 HVAC DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  - 3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  - 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
  - 5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - 7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

- B. 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 Coordination Drawings.
- 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 to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast-brass type with polished chrome-plated finish.
    - g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
  - 2. Existing Piping: Use the following:
    - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.

- b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
  - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
  - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
  - e. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
  - f. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
  - g. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using 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.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
  3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread 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. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 3.6 PAINTING

- A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.7 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

### 3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### 3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### 3.10 GROUTING

- A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.



H. Cure placed grout.

END OF SECTION

section 23 05 29  
hangers and supports for hvac piping and equipment

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 pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

- B. Related Sections:

1. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
  3. Design seismic-restraint hangers and supports for piping and equipment.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
  - 1. Trapeze pipe hangers.
  - 2. Metal framing systems.
  - 3. Fiberglass strut systems.
  - 4. Pipe stands.
  - 5. Equipment supports.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

## 1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

# PART 2 - PRODUCTS

## 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

## 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

## 2.3 METAL FRAMING SYSTEMS

### A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Allied Tube & Conduit.
  - b. Cooper B-Line, Inc.
  - c. Flex-Strut Inc.
  - d. GS Metals Corp.
  - e. Thomas & Betts Corporation.
  - f. Unistrut Corporation; Tyco International, Ltd.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc.

### B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Allied Tube & Conduit.
  - b. Cooper B-Line, Inc.
  - c. Flex-Strut Inc.
  - d. GS Metals Corp.
  - e. Thomas & Betts Corporation.
  - f. Unistrut Corporation; Tyco International, Ltd.
2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.

hangers and supports for hvac piping and equipment

5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

## 2.4 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Carpenter & Paterson, Inc.
  2. Clement Support Services.
  3. ERICO International Corporation.
  4. National Pipe Hanger Corporation.
  5. PHS Industries, Inc.
  6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
  7. Piping Technology & Products, Inc.
  8. Rilco Manufacturing Co., Inc.
  9. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
- C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## 2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, **zinc-coated** steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.6 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
  - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
  - 2. Base: Plastic.
  - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
  - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand:
  - 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
  - 2. Bases: One or more; plastic.
  - 3. Vertical Members: Two or more protective-coated-steel channels.
  - 4. Horizontal Member: Protective-coated-steel channel.
  - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

## 2.7 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

## 2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.
- E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- F. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick 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.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Pipe Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- J. 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.

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- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **NPS 2-1/2** and larger 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.
- M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- O. Insulated Piping:
  - 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 allowed by ASME B31.9 for building services piping.
  - 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.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  - 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 or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
  - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.



### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures 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 so contours of welded surfaces match adjacent contours.

### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 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 a 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.

### 3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
  - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
  - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
  - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
  - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
  - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
  - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
  - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
  - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
  14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
  15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
  16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
  17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
  18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
  19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
  20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
  21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb.
    - b. Medium (MSS Type 32): 1500 lb.
    - c. Heavy (MSS Type 33): 3000 lb.
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
  3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
  4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
  6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

- 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
- 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
  - a. Horizontal (MSS Type 54): Mounted horizontally.
  - b. Vertical (MSS Type 55): Mounted vertically.
  - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

section 23 05 53  
identification for hvac piping and equipment

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. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Duct labels.
  - 5. Stencils.
  - 6. Valve tags.
  - 7. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT LABELS

#### A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 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.
7. Fasteners: Stainless-steel self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

#### B. Label Content: Include equipment's unique equipment number.

#### C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, manufacturer, model number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

### 2.2 WARNING SIGNS AND LABELS

#### A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

#### B. Letter Color: Black.

#### C. Background Color: Yellow.

#### D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

#### E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

#### F. Minimum Letter Size: 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.

#### G. Fasteners: Stainless-steel rivets or self-tapping screws.

#### H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- I. Label Content: Include caution and warning information, plus emergency notification instructions.

## 2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.

## 2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- D. Minimum Letter Size: 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.
- E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- F. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.

## 2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.



1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

## 2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
1. Size: 3 by 5-1/4 inches minimum.
  2. Fasteners: Brass grommet and wire.
  3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  4. Color: Yellow background with black lettering.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in other sections.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed 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 inaccessible 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 labels.

C. Pipe Label Color Schedule:

1. Refrigerant Piping:
  - a. Background Color: Orange.
  - b. Letter Color: Black.

### 3.4 DUCT LABEL INSTALLATION

- A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:
  1. Blue: For cold-air supply ducts.
  2. Yellow: For hot-air supply ducts.
  3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
  4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
- B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

### 3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; 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 subparagraphs:
  1. Valve-Tag Size and Shape:
    - a. All Valve-Tags: 1-1/2 inches minimum, round.
  2. Valve-Tag Color:
    - a. All Valve-Tags: Natural.
  3. Letter Color:
    - a. All Valve-Tags: Black.

### 3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

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. Balancing Air Systems:
    - a. Constant-volume air systems.
    - b. Variable-air-volume systems.
  - 2. Balancing Hydronic Piping Systems:
    - a. Constant-flow hydronic systems.
    - b. Variable-flow hydronic systems.
    - c. Primary-secondary hydronic systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. TAB: Testing, adjusting, and balancing.
- C. TAB Specialist: An entity engaged to perform TAB Work.

1.4 ACTION SUBMITTALS

- A. LEED Submittals:
  - 1. Air-Balance Report for Prerequisite IEQ 1: Documentation of work performed for ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
  - 2. TAB Report for Prerequisite EA 2: Documentation of work performed for ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. Certified TAB reports.
- E. Sample report forms.
- F. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.

## 1.6 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC.
  - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.
  - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.
- B. TAB Conference: Meet with **[Architect]** **[Owner]** **[Construction Manager]** **[Commissioning Authority]** on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.
  - 1. Agenda Items:
    - a. The Contract Documents examination report.
    - b. The TAB plan.
    - c. Coordination and cooperation of trades and subcontractors.
    - d. Coordination of documentation and communication flow.
- C. Certify TAB field data reports and perform the following:
  - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

- D. TAB Report Forms: Use standard TAB contractor's forms approved by [Architect] [Owner] [Construction Manager] [Commissioning Authority].
- E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

#### 1.7 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

#### 1.8 COORDINATION

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.

- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
  - 1. 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.
  - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that 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 verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.

testing, adjusting, and balancing for hvac

- B. Complete system-readiness checks and prepare 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 indicated conditions for system operations can be met.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, and SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
  3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.



- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

### 3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
  - 2. Measure fan static pressures as follows to determine actual static pressure:
    - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Report the cleanliness status of filters and the time static pressures are measured.
  - 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
  - 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

6. Obtain approval from [Architect] [Owner] [Construction Manager] [Commissioning Authority] for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure airflow of submain and branch ducts.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
  3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
  2. Adjust patterns of adjustable outlets for proper distribution without drafts.
- 3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS
- A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
- B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
  2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
  3. Measure total system airflow. Adjust to within indicated airflow.
  4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
  5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
    - a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
  6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
    - a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
  7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
  8. Record final fan-performance data.
- C. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
1. Balance variable-air-volume systems the same as described for constant-volume air systems.
  2. Set terminal units and supply fan at full-airflow condition.
  3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
  4. Readjust fan airflow for final maximum readings.
  5. Measure operating static pressure at the sensor that controls the supply fan if one is installed, and verify operation of the static-pressure controller.
  6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
  7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
    - a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
  - a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
- D. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
  1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
  2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
  3. Set terminal units at full-airflow condition.
  4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
  5. Adjust terminal units for minimum airflow.
  6. Measure static pressure at the sensor.
  7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

### 3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
  1. Open all manual valves for maximum flow.
  2. Check liquid level in expansion tank.
  3. Check makeup water-station pressure gage for adequate pressure for highest vent.
  4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
  5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
  6. Set system controls so automatic valves are wide open to heat exchangers.
  7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
  8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

### 3.8 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
  - 1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
    - a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from [Architect] [Owner] [Construction Manager] [Commissioning Authority] and comply with requirements in Section 232123 "Hydronic Pumps."
  - 2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
    - a. Monitor motor performance during procedures and do not operate motors in overload conditions.
  - 3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
  - 4. Report flow rates that are not within plus or minus 10 percent of design.
- B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.
- C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.
- D. Set calibrated balancing valves, if installed, at calculated presettings.
- E. Measure flow at all stations and adjust, where necessary, to obtain first balance.
  - 1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.
- F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.
- G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
  - 1. Determine the balancing station with the highest percentage over indicated flow.
  - 2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
  - 3. Record settings and mark balancing devices.

- H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.
- I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.
- J. Check settings and operation of each safety valve. Record settings.

### 3.9 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

### 3.10 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

- A. Balance the primary circuit flow first and then balance the secondary circuits.

### 3.11 PROCEDURES FOR STEAM SYSTEMS

- A. Measure and record upstream and downstream pressure of each piece of equipment.
- B. Measure and record upstream and downstream steam pressure of pressure-reducing valves.
- C. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.
- D. Check settings and operation of each safety valve. Record settings.
- E. Verify the operation of each steam trap.

### 3.12 PROCEDURES FOR HEAT EXCHANGERS

- A. Measure water flow through all circuits.
- B. Adjust water flow to within specified tolerances.
- C. Measure inlet and outlet water temperatures.
- D. Measure inlet steam pressure.
- E. Check settings and operation of safety and relief valves. Record settings.

### 3.13 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
  2. Motor horsepower rating.
  3. Motor rpm.
  4. Efficiency rating.
  5. Nameplate and measured voltage, each phase.
  6. Nameplate and measured amperage, each phase.
  7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

### 3.14 PROCEDURES FOR CHILLERS

- A. Balance water flow through each evaporator and condenser to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:
1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
  2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
  3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
  4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
  5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
  6. Capacity: Calculate in tons of cooling.
  7. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

### 3.15 PROCEDURES FOR COOLING TOWERS

- A. Shut off makeup water for the duration of the test, and verify that makeup and blowdown systems are fully operational after tests and before leaving the equipment. Perform the following tests and record the results:
1. Measure condenser-water flow to each cell of the cooling tower.
  2. Measure entering- and leaving-water temperatures.
  3. Measure wet- and dry-bulb temperatures of entering air.
  4. Measure wet- and dry-bulb temperatures of leaving air.
  5. Measure condenser-water flow rate recirculating through the cooling tower.

6. Measure cooling-tower spray pump discharge pressure.
7. Adjust water level and feed rate of makeup water system.
8. Measure flow through bypass.

### 3.16 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

### 3.17 PROCEDURES FOR BOILERS

- A. Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.
- B. Steam Boilers: Measure and record entering-water temperature and flow and leaving-steam pressure, temperature, and flow.

### 3.18 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each water coil:
  1. Entering- and leaving-water temperature.
  2. Water flow rate.
  3. Water pressure drop.
  4. Dry-bulb temperature of entering and leaving air.
  5. Wet-bulb temperature of entering and leaving air for cooling coils.
  6. Airflow.
  7. Air pressure drop.
- B. Measure, adjust, and record the following data for each electric heating coil:
  1. Nameplate data.
  2. Airflow.
  3. Entering- and leaving-air temperature at full load.
  4. Voltage and amperage input of each phase at full load and at each incremental stage.
  5. Calculated kilowatt at full load.
  6. Fuse or circuit-breaker rating for overload protection.
- C. Measure, adjust, and record the following data for each steam coil:
  1. Dry-bulb temperature of entering and leaving air.
  2. Airflow.
  3. Air pressure drop.
  4. Inlet steam pressure.
- D. Measure, adjust, and record the following data for each refrigerant coil:



1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

### 3.19 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
  1. Measure and record the operating speed, airflow, and static pressure of each fan.
  2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
  3. Check the refrigerant charge.
  4. Check the condition of filters.
  5. Check the condition of coils.
  6. Check the operation of the drain pan and condensate-drain trap.
  7. Check bearings and other lubricated parts for proper lubrication.
  8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
  1. New filters are installed.
  2. Coils are clean and fins combed.
  3. Drain pans are clean.
  4. Fans are clean.
  5. Bearings and other parts are properly lubricated.
  6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
  1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
  2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
  3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
  4. Balance each air outlet.

### 3.20 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

### 3.21 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

### 3.22 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
  2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  1. Pump curves.
  2. Fan curves.
  3. Manufacturers' test data.
  4. Field test reports prepared by system and equipment installers.
  5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
  1. Title page.
  2. Name and address of the TAB contractor.
  3. Project name.
  4. Project location.
  5. Architect's name and address.
  6. Engineer's name and address.
  7. Contractor's name and address.
  8. Report date.
  9. Signature of TAB supervisor who certifies the report.
  10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.

- c. Description of system operation sequence if it varies from the Contract Documents.
- 12. Nomenclature sheets for each item of equipment.
- 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
- 14. Notes to explain why certain final data in the body of reports vary from indicated values.
- 15. Test conditions for fans and pump performance forms including the following:
  - a. Settings for outdoor-, return-, and exhaust-air dampers.
  - b. Conditions of filters.
  - c. Cooling coil, wet- and dry-bulb conditions.
  - d. Face and bypass damper settings at coils.
  - e. Fan drive settings including settings and percentage of maximum pitch diameter.
  - f. Inlet vane settings for variable-air-volume systems.
  - g. Settings for supply-air, static-pressure controller.
  - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
  - 1. Quantities of outdoor, supply, return, and exhaust airflows.
  - 2. Water and steam flow rates.
  - 3. Duct, outlet, and inlet sizes.
  - 4. Pipe and valve sizes and locations.
  - 5. Terminal units.
  - 6. Balancing stations.
  - 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches, and bore.
    - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - j. Number, make, and size of belts.
    - k. Number, type, and size of filters.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.

testing, adjusting, and balancing for hvac

- e. Sheave make, size in inches, and bore.
- f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

- a. Total air flow rate in cfm.
- b. Total system static pressure in inches wg.
- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Filter static-pressure differential in inches wg.
- f. Preheat-coil static-pressure differential in inches wg.
- g. Cooling-coil static-pressure differential in inches wg.
- h. Heating-coil static-pressure differential in inches wg.
- i. Outdoor airflow in cfm.
- j. Return airflow in cfm.
- k. Outdoor-air damper position.
- l. Return-air damper position.
- m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

- a. System identification.
- b. Location.
- c. Coil type.
- d. Number of rows.
- e. Fin spacing in fins per inch o.c.
- f. Make and model number.
- g. Face area in sq. ft..
- h. Tube size in NPS.
- i. Tube and fin materials.
- j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

- a. Air flow rate in cfm.
- b. Average face velocity in fpm.
- c. Air pressure drop in inches wg.
- d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
- e. Return-air, wet- and dry-bulb temperatures in deg F.
- f. Entering-air, wet- and dry-bulb temperatures in deg F.
- g. Leaving-air, wet- and dry-bulb temperatures in deg F.
- h. Water flow rate in gpm.
- i. Water pressure differential in feet of head or psig.
- j. Entering-water temperature in deg F.
- k. Leaving-water temperature in deg F.
- l. Refrigerant expansion valve and refrigerant types.
- m. Refrigerant suction pressure in psig.
- n. Refrigerant suction temperature in deg F.
- o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and unit size.
- e. Manufacturer's serial number.
- f. Fuel type in input data.
- g. Output capacity in Btu/h.
- h. Ignition type.
- i. Burner-control types.
- j. Motor horsepower and rpm.
- k. Motor volts, phase, and hertz.
- l. Motor full-load amperage and service factor.
- m. Sheave make, size in inches, and bore.
- n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

- a. Total air flow rate in cfm.
- b. Entering-air temperature in deg F.
- c. Leaving-air temperature in deg F.
- d. Air temperature differential in deg F.
- e. Entering-air static pressure in inches wg.
- f. Leaving-air static pressure in inches wg.
- g. Air static-pressure differential in inches wg.
- h. Low-fire fuel input in Btu/h.
- i. High-fire fuel input in Btu/h.
- j. Manifold pressure in psig.
- k. High-temperature-limit setting in deg F.
- l. Operating set point in Btu/h.
- m. Motor voltage at each connection.
- n. Motor amperage for each phase.
- o. Heating value of fuel in Btu/h.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and size.
- e. Manufacturer's serial number.
- f. Arrangement and class.
- g. Sheave make, size in inches, and bore.
- h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

- a. Motor make, and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.
- f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
- g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm.
- b. Total system static pressure in inches wg.
- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

- a. System and air-handling-unit number.
- b. Location and zone.
- c. Traverse air temperature in deg F.
- d. Duct static pressure in inches wg.
- e. Duct size in inches.
- f. Duct area in sq. ft..
- g. Indicated air flow rate in cfm.
- h. Indicated velocity in fpm.
- i. Actual air flow rate in cfm.
- j. Actual average velocity in fpm.
- k. Barometric pressure in psig.

J. Air-Terminal-Device Reports:

1. Unit Data:

- a. System and air-handling unit identification.
- b. Location and zone.
- c. Apparatus used for test.
- d. Area served.
- e. Make.
- f. Number from system diagram.
- g. Type and model number.
- h. Size.
- i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

- a. Air flow rate in cfm.

- b. Air velocity in fpm.
  - c. Preliminary air flow rate as needed in cfm.
  - d. Preliminary velocity as needed in fpm.
  - e. Final air flow rate in cfm.
  - f. Final velocity in fpm.
  - g. Space temperature in deg F.
- K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
  - 1. Unit Data:
    - a. System and air-handling-unit identification.
    - b. Location and zone.
    - c. Room or riser served.
    - d. Coil make and size.
    - e. Flowmeter type.
  - 2. Test Data (Indicated and Actual Values):
    - a. Air flow rate in cfm.
    - b. Entering-water temperature in deg F.
    - c. Leaving-water temperature in deg F.
    - d. Water pressure drop in feet of head or psig.
    - e. Entering-air temperature in deg F.
    - f. Leaving-air temperature in deg F.
- L. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Service.
    - d. Make and size.
    - e. Model number and serial number.
    - f. Water flow rate in gpm.
    - g. Water pressure differential in feet of head or psig.
    - h. Required net positive suction head in feet of head or psig.
    - i. Pump rpm.
    - j. Impeller diameter in inches.
    - k. Motor make and frame size.
    - l. Motor horsepower and rpm.
    - m. Voltage at each connection.
    - n. Amperage for each phase.
    - o. Full-load amperage and service factor.
    - p. Seal type.
  - 2. Test Data (Indicated and Actual Values):
    - a. Static head in feet of head or psig.
    - b. Pump shutoff pressure in feet of head or psig.

- c. Actual impeller size in inches.
- d. Full-open flow rate in gpm.
- e. Full-open pressure in feet of head or psig.
- f. Final discharge pressure in feet of head or psig.
- g. Final suction pressure in feet of head or psig.
- h. Final total pressure in feet of head or psig.
- i. Final water flow rate in gpm.
- j. Voltage at each connection.
- k. Amperage for each phase.

M. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

### 3.23 INSPECTIONS

A. Initial Inspection:

- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- 2. Check the following for each system:
  - a. Measure airflow of at least 10 percent of air outlets.
  - b. Measure water flow of at least 5 percent of terminals.
  - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
  - d. Verify that balancing devices are marked with final balance position.
  - e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by **[Architect]** **[Owner]** **[Construction Manager]** **[Commissioning Authority]**.
- 2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of **[Architect]** **[Owner]** **[Construction Manager]** **[Commissioning Authority]**.
- 3. **[Architect]** **[Owner]** **[Construction Manager]** **[Commissioning Authority]** shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.



4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
  5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
  2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.
- D. Prepare test and inspection reports.

### 3.24 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

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 insulating the following duct services:
  - 1. Indoor, concealed supply and outdoor air.
  - 2. Indoor, exposed supply and outdoor air.
  - 3. Indoor, concealed return located in unconditioned space.
  - 4. Indoor, exposed return located in unconditioned space.
  - 5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
  - 6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
  - 7. Indoor, concealed oven and warewash exhaust.
  - 8. Indoor, exposed oven and warewash exhaust.
  - 9. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
  - 10. Outdoor, concealed supply and return.
  - 11. Outdoor, exposed supply and return.
- B. Related Sections:
  - 1. Section 230716 "HVAC Equipment Insulation."
  - 2. Section 230719 "HVAC Piping Insulation."
  - 3. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
  - 3. Detail application of field-applied jackets.
  - 4. Detail application at linkages of control devices.

- C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sheet Form Insulation Materials: 12 inches square.
2. Sheet Jacket Materials: 12 inches square.
3. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

#### 1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance

requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

- C. Coordinate installation and testing of heat tracing.

## 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corp.; SoftTouch Duct Wrap.
    - b. Johns Manville; Microlite.
    - c. Knauf Insulation; Friendly Feel Duct Wrap.
    - d. Owens Corning; SOFTR All-Service Duct Wrap.
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. CertainTeed Corp.; Commercial Board.
- b. Fibrex Insulations Inc.; FBX.
- c. Johns Manville; 800 Series Spin-Glas.
- d. Knauf Insulation; Insulation Board.
- e. Manson Insulation Inc.; AK Board.
- f. Owens Corning; Fiberglas 700 Series.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied [FSK jacket] complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. CertainTeed Corp.; CrimpWrap.
- b. Johns Manville; MicroFlex.
- c. Knauf Insulation; Pipe and Tank Insulation.
- d. Manson Insulation Inc.; AK Flex.
- e. Owens Corning; Fiberglas Pipe and Tank Insulation.

## 2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with ASTM C 656, Type II, Grade 6. Tested and certified to provide a [1] [2]-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Johns Manville; Super Firetemp M.

B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a [1] [2]-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. CertainTeed Corp.; FlameChek.
- b. Johns Manville; Firetemp Wrap.
- c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
- d. Thermal Ceramics; FireMaster Duct Wrap.
- e. 3M; Fire Barrier Wrap Products.
- f. Unifrax Corporation; FyreWrap.

## 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.Eagle Bridges - Marathon Industries; 225.
    - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.Mon-Eco Industries, Inc.; 22-25.
  - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive 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."
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    - b. Eagle Bridges - Marathon Industries; 225.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.Mon-Eco Industries, Inc.; 22-25.
  - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive 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."

## 2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
  - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
  - 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
    - b. Vimasco Corporation; 749.
  - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  - 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
    - b. Eagle Bridges - Marathon Industries; 550.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
    - d. Mon-Eco Industries, Inc.; 55-50.
    - e. Vimasco Corporation; WC-1/WC-5.
  - 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: 60 percent by volume and 66 percent by weight.
  - 5. Color: White.

## 2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
- 1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
    - b. Vimasco Corporation; 713 and 714.
  - 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
  - 4. Service Temperature Range: 0 to plus 180 deg F.
  - 5. Color: White.

## 2.6 SEALANTS

### A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.Eagle Bridges - Marathon Industries; 405.
  - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
  - c. Mon-Eco Industries, Inc.; 44-05.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants 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."

## 2.7 FACTORY-APPLIED JACKETS

- ### A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## 2.8 FIELD-APPLIED JACKETS

- ### A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- ### B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

## 2.9 TAPES

- ### A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. ABI, Ideal Tape Division; 491 AWF FSK.
    - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    - c. Compac Corporation; 110 and 111.
    - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
  2. Width: 3 inches.



3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

## 2.10 SECUREMENTS

### A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. ITW Insulation Systems; Gerrard Strapping and Seals.
  - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015-inch-thick, 1/2 inch wide with wing seal or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

### B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
  - a. Products: Subject to compliance with requirements, provide one of the following:
    - 1) AGM Industries, Inc.; CHP-1.
    - 2) GEMCO; Cupped Head Weld Pin.
    - 3) Midwest Fasteners, Inc.; Cupped Head.
    - 4) Nelson Stud Welding; CHP.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
  - a. Products: Subject to compliance with requirements, provide one of the following:
    - 1) AGM Industries, Inc.; RC-150.
    - 2) GEMCO; R-150.
    - 3) Midwest Fasteners, Inc.; WA-150.
    - 4) Nelson Stud Welding; Speed Clips.
  - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

3. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) GEMCO.
- 2) Midwest Fasteners, Inc.

- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

- D. Wire: 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. C & F Wire.

## 2.11 CORNER ANGLES

- A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
  - 1. Comply with requirements in Section 078413 "Penetration Firestopping"irestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
  - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
  - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
  2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
    - e. Impale insulation over pins and attach speed washers.
    - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
  5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
  6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
  - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
  - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
  - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
  - d. Do not overcompress insulation during installation.
  - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
  - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
  - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

### 3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
  2. Install lap or joint strips with same material as jacket.
  3. Secure jacket to insulation with manufacturer's recommended adhesive.
  4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
  5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

### 3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

### 3.8 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.10 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Outdoor, concealed supply and return.
10. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

### 3.11 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, supply-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.

B. Concealed, return-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.

C. Concealed, outdoor-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.



- D. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.
- E. Exposed, supply-air duct and plenum insulation shall be the following:
  - 1. Internally lined per Section 233113 "Metal Ducts."
- F. Exposed, return-air duct and plenum insulation shall be the following:
  - 1. Internally lined per Section 233113 "Metal Ducts."
- G. Exposed, outdoor-air duct and plenum insulation shall be the following:
  - 1. Internally lined per Section 233113 "Metal Ducts."
- H. Exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.

### 3.12 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.
- B. Outdoor, supply-air duct and plenum insulation shall be the following:
  - 1. Internally lined per Section 233113 "Metal Ducts."
- C. Outdoor, return-air duct and plenum insulation shall be the following:
  - 1. Internally lined per Section 233113 "Metal Ducts."
- D. Outdoor, outdoor-air duct and plenum insulation shall be the following:
  - 1. Internally lined per Section 233113 "Metal Ducts."

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 insulating the following HVAC piping systems:
  - 1. Condensate drain piping, indoors and outdoors.
  - 2. Chilled-water piping, indoors and outdoors.
  - 3. Heating hot-water piping, indoors and outdoors.
  - 4. Refrigerant suction and hot-gas piping, indoors and outdoors.
- B. Related Sections:
  - 1. Section 230713 "Duct Insulation."
  - 2. Section 230716 "HVAC Equipment Insulation."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Detail attachment and covering of heat tracing inside insulation.
  - 3. Detail insulation application at pipe expansion joints for each type of insulation.
  - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  - 5. Detail removable insulation at piping specialties.
  - 6. Detail application of field-applied jackets.
  - 7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

#### 1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

#### 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Aeroflex USA, Inc.; Aerocel.
    - b. Armacell LLC; AP Armaflex.
    - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- G. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Fibrex Insulations Inc.; Coreplus 1200.
    - b. Johns Manville; Micro-Lok.
    - c. Knauf Insulation; 1000-Degree Pipe Insulation.
    - d. Manson Insulation Inc.; Alley-K.
    - e. Owens Corning; Fiberglas Pipe Insulation.
  - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100

deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. CertainTeed Corp.; CrimpWrap.
- b. Johns Manville; MicroFlex.
- c. Knauf Insulation; Pipe and Tank Insulation.
- d. Manson Insulation Inc.; AK Flex.
- e. Owens Corning; Fiberglas Pipe and Tank Insulation.

## 2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Ramco Insulation, Inc.; Super-Stik.

## 2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Aeroflex USA, Inc.; Aeroseal.
- b. Armacell LLC; Armaflex 520 Adhesive.
- c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
- d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive 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."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
- b. Eagle Bridges - Marathon Industries; 225.
- c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
- d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive 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."
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    - b. Eagle Bridges - Marathon Industries; 225.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
    - d. Mon-Eco Industries, Inc.; 22-25.
  2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive 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."

## 2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
    - b. Vimasco Corporation; 749.
  2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 180 deg F.
  4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
  - b. Eagle Bridges - Marathon Industries; 550.
  - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
  - d. Mon-Eco Industries, Inc.; 55-50.
  - e. Vimasco Corporation; WC-1/WC-5.
- 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: 60 percent by volume and 66 percent by weight.
  - 5. Color: White.

## 2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
  - 1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
    - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
    - c. Vimasco Corporation; 713 and 714.
  - 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
  - 4. Service Temperature Range: 0 to plus 180 deg F.
  - 5. Color: White.

## 2.6 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    - b. Eagle Bridges - Marathon Industries; 405.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
    - d. Mon-Eco Industries, Inc.; 44-05.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 5. Color: Aluminum.

6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants 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. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants 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."

## 2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## 2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. Metal Jacket:
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    - b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    - c. RPR Products, Inc.; Insul-Mate.



2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
  - a. Factory cut and rolled to size.
  - b. Finish and thickness are indicated in field-applied jacket schedules.
  - c. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
  - d. Factory-Fabricated Fitting Covers:
    - 1) Same material, finish, and thickness as jacket.
    - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - 3) Tee covers.
    - 4) Flange and union covers.
    - 5) End caps.
    - 6) Beveled collars.
    - 7) Valve covers.
    - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

## 2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. ABI, Ideal Tape Division; 428 AWF ASJ.
    - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    - c. Compac Corporation; 104 and 105.
    - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
  2. Width: 3 inches.
  3. Thickness: 11.5 mils.
  4. Adhesion: 90 ounces force/inch in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/inch in width.
  7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. ABI, Ideal Tape Division; 491 AWF FSK.
    - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    - c. Compac Corporation; 110 and 111.
    - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
  2. Width: 3 inches.
  3. Thickness: 6.5 mils.
  4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

## 2.10 SECUREMENTS

### A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. ITW Insulation Systems; Gerrard Strapping and Seals.
  - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

### B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

### C. Wire: 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. C & F Wire.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  1. Install insulation continuously through hangers and around anchor attachments.
  2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Manholes.
  - 5. Handholes.
  - 6. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
  2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with

insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
  1. Install pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
  4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
  1. Install mitered sections of pipe insulation.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
  1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  3. Install insulation to flanges as specified for flange insulation application.
  4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.7 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
  1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

### 3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.



### 3.9 FINISHES

- A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
  - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.11 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.12 INDOOR PIPING INSULATION SCHEDULE

- A. Condensate and Equipment Drain Water:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Flexible Elastomeric: 1 inch thick.
- B. Chilled Water:
  - 1. Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.
- C. Heating-Hot-Water Supply and Return:
  - 1. Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.
- D. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Flexible Elastomeric: 1 inch thick.

### 3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Chilled Water:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3 inches thick.
- B. Heating-Hot-Water Supply and Return:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
- C. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Flexible Elastomeric: 2 inches thick.

### 3.14 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

- A. Loose-fill insulation, for belowground piping, is specified in Section 232113.13 "Underground Hydronic Piping".

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
  - 1. None.
- D. Piping, Exposed:
  - 1. None.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
  - 1. None.
- D. Piping, Exposed:
  - 1. Painted Aluminum, Corrugated: 0.024 inch thick.

3.17 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

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. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
  - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
  - 2. Hot-Gas and Liquid Lines: 535 psig.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
  - 1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

## 1.6 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."

## 1.7 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.

## PART 2 - PRODUCTS

### 2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type L.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Brazing Filler Metals: AWS A5.8.

### 2.2 REFRIGERANTS

- A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines for Conventional Air-Conditioning Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed joints.
- B. Hot-Gas and Liquid Lines: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

### 3.2 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. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- J. 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 Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- K. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- L. 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. Liquid lines may be installed level.
- M. When brazing, 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.
- N. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- O. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."
- P. Install sleeves for piping penetrations of walls, ceilings, and floors.
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs.
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

### 3.3 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. 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.

### 3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Section 230529 "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 long.
  - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
  - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
  - 4. Spring hangers to support vertical runs.
  - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
  - 1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  - 2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  - 3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
  - 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  - 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  - 6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  - 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
  - 8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
  - 9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.
- D. Support multifloor vertical runs at least at each floor.

### 3.5 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.

3.6 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. 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.
4. Charge system with a new filter-dryer core in charging line.

3.7 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. Verify that compressor oil level is correct.
  2. Open compressor suction and discharge valves.
  3. Open refrigerant valves except bypass valves that are used for other purposes.
  4. 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. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
  - a. Lighting fixtures.
  - b. Air outlets and inlets.
  - c. Speakers.
  - d. Sprinklers.
  - e. Access panels.
  - f. Perimeter moldings.

B. Welding certificates.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

metal ducts  
23 31 13 - 2

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
  2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

## PART 2 - PRODUCTS

### 2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

### 2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Lindab Inc.
    - b. McGill AirFlow LLC.
    - c. SEMCO Incorporated.
    - d. Sheet Metal Connectors, Inc.
    - e. Spiral Manufacturing Co., Inc.

- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.3 SHEET METAL MATERIALS

- A. General Material Requirements: 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: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G90.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. 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.

## 2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation; Insulation Group.
    - b. Johns Manville.
    - c. Knauf Insulation.
    - d. Owens Corning.
  2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
  3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
    - a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    - b. Adhesive 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. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
  2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. 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.
  2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
  3. Butt transverse joints without gaps, and coat joint with adhesive.
  4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
  5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
  6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
  7. 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.

8. 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:
  - a. Fan discharges.
  - b. Intervals of lined duct preceding unlined duct.
  - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. 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.
  - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. 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.

## 2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
  1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
  2. Tape Width: 4 inches.
  3. Sealant: Modified styrene acrylic.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  7. Service: Indoor and outdoor.
  8. Service Temperature: Minus 40 to plus 200 deg F.
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
  10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  11. 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."
- C. Water-Based Joint and Seam Sealant:
  1. Application Method: Brush on.
  2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. 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."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

## 2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

## 2.7 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Cooper B-Line, Inc.; a division of Cooper Industries.
  2. Ductmate Industries, Inc.
  3. Hilti Corp.
  4. Mason Industries.
  5. TOLCO; a brand of NIBCO INC.
  6. Unistrut Corporation; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by the Office of Statewide Health Planning and Development for the State of California.
  1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.



- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- 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. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 2. Outdoor, Supply-Air Ducts: Seal Class A.
  - 3. Outdoor, Exhaust Ducts: Seal Class C.
  - 4. Outdoor, Return-Air Ducts: Seal Class C.
  - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
  - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
  - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
  - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
  - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
  - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
  - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
  - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
  - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
  - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.

- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems" and ASCE/SEI 7.
  - 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
  - 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by the Office of Statewide Health Planning and Development for the State of California.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
  - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
  - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
  - 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

### 3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.7 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

### 3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
  - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
  - 2. Test the following systems:
    - a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
    - b. Supply, Return, Outdoor Air, Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.
  - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
  - 4. Test for leaks before applying external insulation.
  - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
  - 6. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
  - 1. Visually inspect duct system to ensure that no visible contaminants are present.
  - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
    - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

### 3.9 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
  - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
  - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
  - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
  - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
  - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
  - 1. Air outlets and inlets (registers, grilles, and diffusers).
  - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  - 4. Coils and related components.
  - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
  - 6. Supply-air ducts, dampers, actuators, and turning vanes.
  - 7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
  - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
  - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
  - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
  - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

### 3.10 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

### 3.11 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.
- B. Supply Ducts:
  1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12.
  2. Ducts Connected to Air-Handling Units:
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12.
  3. Ducts Connected to Equipment Not Listed Above:
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- C. Return Ducts:
  1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12.
  2. Ducts Connected to Air-Handling Units:

- a. Pressure Class: Positive or negative 2-inch wg.
  - b. Minimum SMACNA Seal Class: C.
  - c. SMACNA Leakage Class for Rectangular: 24.
  - d. SMACNA Leakage Class for Round and Flat Oval: 12
- 3. Ducts Connected to Equipment Not Listed Above:
  - a. Pressure Class: Positive or negative 2-inch wg.
  - b. Minimum SMACNA Seal Class: C.
  - c. SMACNA Leakage Class for Rectangular: 24.
  - d. SMACNA Leakage Class for Round and Flat Oval: 12
- D. Exhaust Ducts:
  - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
    - a. Pressure Class: Negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12
  - 2. Ducts Connected to Air-Handling Units:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12
  - 3. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
    - a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
    - b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
    - c. Welded seams and joints.
    - d. Pressure Class: Positive or negative 2-inch wg.
    - e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
    - f. SMACNA Leakage Class: 3.
  - 4. Ducts Connected to Dishwasher Hoods:
    - a. Type 304, stainless-steel sheet.
    - b. Exposed to View: No. 4 finish.
    - c. Concealed: No. 2D finish.
    - d. Welded seams and flanged joints with watertight EPDM gaskets.
    - e. Pressure Class: Positive or negative 2-inch wg.
    - f. SMACNA Leakage Class: 3.
  - 5. Ducts Connected to Fans Exhausting Laboratory and Process (ASHRAE 62.1, Class 3 and 4) Air:
    - a. Type 316, stainless-steel sheet.
      - 1) Exposed to View: No. 4 finish.
      - 2) Concealed: No. 2D finish.

- b. Pressure Class: Positive or negative 2-inch wg.
  - c. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
  - d. SMACNA Leakage Class: 3.
- 6. Ducts Connected to Equipment Not Listed Above:
  - a. Pressure Class: Positive or negative 2-inch wg.
  - b. Minimum SMACNA Seal Class: C.
  - c. SMACNA Leakage Class for Rectangular: 24.
  - d. SMACNA Leakage Class for Round and Flat Oval: 12
- E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
  - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12
  - 2. Ducts Connected to Air-Handling Units:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12
  - 3. Ducts Connected to Equipment Not Listed Above:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12
- F. Intermediate Reinforcement:
  - 1. Galvanized-Steel Ducts: Galvanized steel.
- G. Liner:
  - 1. Supply and Return Air Ducts and Plenums: Fibrous glass, Type I, 1-1/2 inches thick.
  - 2. Transfer Ducts: Fibrous glass, Type I, 2 inches thick.
- H. Elbow Configuration:
  - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
    - a. Velocity 1000 fpm or Lower:
      - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      - 2) Mitered Type RE 4 without vanes.



- b. Velocity 1000 to 1500 fpm:
    - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
    - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
    - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
  - c. Velocity 1500 fpm or Higher:
    - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
- a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
  - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
  - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
    - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
    - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
    - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
    - 4) Radius-to Diameter Ratio: 1.5.
  - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
  - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- I. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
- a. Rectangular Main to Rectangular Branch: 45-degree entry.
  - b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
  - a. Velocity 1000 fpm or Lower: 90-degree tap.
  - b. Velocity 1000 to 1500 fpm: Conical tap.
  - c. Velocity 1500 fpm or Higher: 45-degree lateral.

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. Backdraft and pressure relief dampers.
  - 2. Barometric relief dampers.
  - 3. Manual volume dampers.
  - 4. Control dampers.
  - 5. Fire dampers.
  - 6. Ceiling radiation dampers.
  - 7. Combination fire and smoke dampers.
  - 8. Flange connectors.
  - 9. Duct silencers.
  - 10. Turning vanes.
  - 11. Remote damper operators.
  - 12. Duct-mounted access doors.
  - 13. Flexible connectors.
  - 14. Flexible ducts.
  - 15. Duct accessory hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
  - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
    - a. Special fittings.
    - b. Manual volume damper installations.
    - c. Control-damper installations.

- d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
- e. Duct security bars.
- f. Wiring Diagrams: For power, signal, and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- B. Source quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. 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.

#### 2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G90.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. 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.

## 2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Pottorff.
  - 3. Ruskin Company.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2500 fpm.
- D. Maximum System Pressure: 2-inch wg.
- E. Frame: Hat-shaped, 18-gage galvanized sheet steel, with welded corners or mechanically attached and mounting flange.
- F. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Extruded vinyl, mechanically locked.
- I. Blade Axles:
  - 1. Material: Plated steel.
  - 2. Diameter: 0.20 inch.
- J. Tie Bars and Brackets: Galvanized steel.
- K. Return Spring: Adjustable tension.
- L. Bearings: Synthetic pivot bushings.
- M. Accessories:
  - 1. Adjustment device to permit setting for varying differential static pressure.
  - 2. Counterweights and spring-assist kits for vertical airflow installations.
  - 3. Chain pulls.
  - 4. Screen Mounting: Front mounted in sleeve.
    - a. Sleeve Thickness: 20 gage minimum.
    - b. Sleeve Length: 6 inches minimum.
  - 5. Screen Mounting: Rear mounted.
  - 6. Screen Material: Galvanized steel.
  - 7. Screen Type: Bird.
  - 8. 90-degree stops.

## 2.4 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Pottorff.
  - 3. Ruskin Company.
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 2-inch wg.
- E. Frame: Hat-shaped, 16-gage, galvanized sheet steel with welded corners or mechanically attached and mounting flange.
- F. Blades:
  - 1. Multiple, 0.025-inch- thick, roll-formed aluminum.
  - 2. Maximum Width: 6 inches.
  - 3. Action: Parallel.
  - 4. Balance: Gravity.
  - 5. Eccentrically pivoted.
- G. Blade Seals: Vinyl.
- H. Blade Axles: Plated steel.
- I. Tie Bars and Brackets:
  - 1. Material: Galvanized steel.
  - 2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Ball.
- L. Accessories:
  - 1. Flange on intake.
  - 2. Adjustment device to permit setting for varying differential static pressures.

## 2.5 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Nailor Industries Inc.

- b. Pottorff.
  - c. Ruskin Company.
  - d. Trox USA Inc.
- 2. Standard leakage rating.
- 3. Suitable for horizontal or vertical applications.
- 4. Frames:
  - a. Frame: Hat-shaped, 20-gage, galvanized sheet steel.
  - b. Mitered and welded corners.
  - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
- 5. Blades:
  - a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized-steel, 0.064 inch thick.
- 6. Blade Axles: Plated steel.
- 7. Bearings:
  - a. Molded synthetic.
  - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 8. Tie Bars and Brackets: Galvanized steel.

## 2.6 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Pottorff.
  - 3. Ruskin Company.
  - 4. Young Regulator Company.
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Frames:
  - 1. Hat shaped.
  - 2. 16-gage, galvanized sheet steel.
  - 3. Reinforced corners.
- D. Blades:
  - 1. Multiple blade with maximum blade width of 6 inches.
  - 2. Opposed-blade design.
  - 3. Aluminum.

4. 0.063 inch thick single skin.
  5. Blade Edging: TPE.
- E. Blade Axles: 1/2-inch- diameter; plated steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F.
- F. Bearings:
1. Molded synthetic.
  2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  3. Thrust bearings at each end of every blade.

## 2.7 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Fan Corporation.
  2. Pottorff.
  3. Ruskin Company.
- B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades outside airstream, fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory-installed, galvanized sheet steel.
1. Minimum Thickness: 0.138 inch thick, and of length to suit application.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

## 2.8 CEILING RADIATION DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:



1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.

B. General Requirements:

1. Labeled according to UL 555C by an NRTL.
2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

D. Blades: Galvanized sheet steel with refractory insulation.

E. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

F. Fire Rating: 1 hour.

## 2.9 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.

F. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.

G. Smoke Detector: Integral, factory wired for single-point connection.

H. Blades: Roll-formed, horizontal, interlocking, 16-gage, galvanized sheet steel.

I. Leakage: Class II.

J. Rated pressure and velocity to exceed design airflow conditions.

K. Mounting Sleeve: Factory-installed, 0.039-inch-thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone caulking.

L. Master control panel for use in dynamic smoke-management systems.

- M. Damper Motors: Two-position action.
- N. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
  - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230900 "Instrumentation and Control for HVAC."
  - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
  - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
  - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
  - 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
  - 7. Electrical Connection: 115 V, single phase, 60 Hz.
- O. Accessories:
  - 1. Test and reset switches, remote mounted.

## 2.10 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Nexus PDQ; Division of Shilco Holdings Inc.
  - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: Roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

## 2.11 DUCT SILENCERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Dynasonics.
  - 2. Industrial Noise Control, Inc.

3. McGill AirFlow LLC.
4. Ruskin Company.
5. Vibro-Acoustics.

B. General Requirements:

1. Factory fabricated.
2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Shape:

1. Rectangular straight with splitters or baffles.
2. Round straight with center bodies or pods.
3. Rectangular elbow with splitters or baffles.
4. Round elbow with center bodies or pods.
5. Rectangular transitional with splitters or baffles.

D. Rectangular Silencer Outer Casing: ASTM A 653/A 653M, G90, galvanized sheet steel, 0.040 inch thick.

E. Round Silencer Outer Casing: ASTM A 653/A 653M, G90, galvanized sheet steel.

1. Sheet Metal Thickness for Units up to 24 Inches in Diameter: 0.034 inch thick.
2. Sheet Metal Thickness for Units 26 through 40 Inches in Diameter: 0.040 inch thick.
3. Sheet Metal Thickness for Units 42 through 52 Inches in Diameter: 0.05 inch thick.
4. Sheet Metal Thickness for Units 54 through 60 Inches in Diameter: 0.064 inch thick.

F. Inner Casing and Baffles: ASTM A 653/A 653M, G90 galvanized sheet metal, 0.034 inch thick, and with 1/8-inch- diameter perforations.

G. Special Construction:

1. Suitable for outdoor use.
2. High transmission loss.

H. Connection Sizes: Match connecting ductwork unless otherwise indicated.

I. Principal Sound-Absorbing Mechanism:

1. Controlled impedance membranes and broadly tuned resonators without absorptive media.
2. Film-lined type with fill material.
  - a. Fill Material: Inert and vermin-proof fibrous material, packed under not less than 15 percent compression.
  - b. Erosion Barrier: Polymer bag enclosing fill, and heat sealed before assembly.

3. Lining: Mylar.
- J. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations. Do not use mechanical fasteners for unit assemblies.
1. Joints: Lock formed and sealed.
  2. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
  3. Reinforcement: Cross or trapeze angles for rigid suspension.
- K. Accessories:
1. Factory-installed end caps to prevent contamination during shipping.
  2. Removable splitters.
- L. Source Quality Control: Test according to ASTM E 477.
1. Record acoustic ratings, including dynamic insertion loss and generated-noise power levels with an airflow of at least 2000-fpm face velocity.
  2. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch wg static pressure, whichever is greater.

## 2.12 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
  2. Duro Dyne Inc.
  3. METALAIRE, Inc.
  4. SEMCO Incorporated.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Double wall.

## 2.13 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Pottorff.
  - 2. Ventfabrics, Inc.
  - 3. Young Regulator Company.
- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Galvanized spiral wire sheath.
- D. Cable: Stainless steel.
- E. Wall-Box Mounting: Recessed.
- F. Wall-Box Cover-Plate Material: Steel.

## 2.14 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Greenheck Fan Corporation.
  - 3. Pottorff.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
  - 1. Door:
    - a. Double wall, rectangular.
    - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    - c. Vision panel.
    - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
    - e. Fabricate doors airtight and suitable for duct pressure class.
  - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
  - 3. Number of Hinges and Locks:
    - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    - b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
    - c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
    - d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
- C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Single wall or double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- thick, fibrous-glass or polystyrene-foam board.

## 2.15 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Ductmate Industries, Inc.
  2. Flame Gard, Inc.
  3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 11-gage carbon steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

## 2.16 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Ductmate Industries, Inc.
  2. Duro Dyne Inc.
  3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, 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.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd..
  2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
  3. Service Temperature: Minus 50 to plus 250 deg F.
- G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
1. Minimum Weight: 16 oz./sq. yd..
  2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
  3. Service Temperature: Minus 67 to plus 500 deg F.
- H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
1. Minimum Weight: 14 oz./sq. yd..
  2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
  3. Service Temperature: Minus 67 to plus 500 deg F.
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
  2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
  7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

## 2.17 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flexmaster U.S.A., Inc.
  2. McGill AirFlow LLC.
  3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, polyethylene film supported by helically wound, galvanized-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 5500 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

C. Flexible Duct Connectors:

1. 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. Non-Clamp Connectors: Adhesive plus sheet metal screws.

## 2.18 DUCT SECURITY BARS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carnes.
2. KEES, Inc.
3. Lloyd Industries, Inc.
4. Metal Form Manufacturing, Inc.
5. Price Industries.

B. Description: Factory-fabricated and field-installed duct security bars.

C. Configuration:

1. Frame: 2-1/2 by 2-1/2 by 1/4 inch angle.
2. Sleeve: 0.1345-inch, continuously welded steel frames with 1-by-1-by-3/16-inch angle frame factory welded to 1 end. To be poured in place or set with concrete block or welded or bolted to wall, one side only. Duct connections on both sides.
3. Horizontal Bars: 1/2 inch.
4. Vertical Bars: 1/2 inch.
5. Bar Spacing: 6 inches.
6. Mounting: Bolted or welded.

D. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

E. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## PART 3 - EXECUTION

### 3.1 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. Install 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 at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
  - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Connect ducts to duct silencers rigidly.
- I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  - 1. On both sides of duct coils.
  - 2. Upstream from duct filters.
  - 3. At outdoor-air intakes and mixed-air plenums.
  - 4. At drain pans and seals.
  - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
  - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
  - 7. At each change in direction and at maximum 50-foot spacing.
  - 8. Upstream from turning vanes.
  - 9. Upstream or downstream from duct silencers.
  - 10. Control devices requiring inspection.
  - 11. Elsewhere as indicated.
- J. Install access doors with swing against duct static pressure.
- K. Access Door Sizes:
  - 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.

- L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- M. Install flexible connectors to connect ducts to equipment.
- N. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- O. Connect diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- P. Connect flexible ducts to metal ducts with draw bands.
- Q. Install duct test holes where required for testing and balancing purposes.
- R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

### 3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Operate dampers to verify full range of movement.
  - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
  - 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
  - 4. Inspect turning vanes for proper and secure installation.
  - 5. Operate remote damper operators to verify full range of movement of operator and damper.

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. Utility set fans.
  - 2. Centrifugal roof ventilators.
  - 3. Ceiling-mounted ventilators.
  - 4. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on actual project site elevations.
- B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material thickness and finishes, including color charts.
  - 5. Dampers, including housings, linkages, and operators.
  - 6. Roof curbs.
  - 7. Fan speed controllers.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
  - 1. Roof framing and support members relative to duct penetrations.
  - 2. Ceiling suspension assembly members.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- B. Field quality-control reports.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

## 1.7 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. Belts: One set for each belt-driven unit.

## 1.8 QUALITY ASSURANCE

- 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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

## 1.9 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

## PART 2 - PRODUCTS

### 2.1 UTILITY SET FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Loren Cook Company.
  - 3. Aerovent; a division of Twin City Fan Companies, Ltd.
- B. Housing: Fabricated of galvanized steel with side sheets fastened with a deep lock seam or welded to scroll sheets.
  - 1. Housing Discharge Arrangement: Adjustable to eight standard positions.
- C. Fan Wheels: Single-width, single inlet; welded to cast-iron or cast-steel hub and spun-steel inlet cone, with hub keyed to shaft.
  - 1. Blade Materials: Steel.
  - 2. Blade Type: Backward inclined.
- D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
- E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L<sub>50</sub> of 200,000 hours.
  - 1. Extend grease fitting to accessible location outside of unit.
- F. Belt Drives:
  - 1. Factory mounted, with final alignment and belt adjustment made after installation
  - 2. Service Factor Based on Fan Motor Size: 1.5.
  - 3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
  - 4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
  - 5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.
- G. Accessories:
  - 1. Inlet and Outlet: Flanged.
  - 2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
  - 3. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.
  - 4. Access Door: Gasketed door in scroll with latch-type handles.
  - 5. Inlet Screens: Removable wire mesh.
  - 6. Drain Connections: NPS 3/4 threaded coupling drain connection installed at lowest point of housing.

7. Weather Hoods: Weather resistant with stamped vents over motor and drive compartment.

## 2.2 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Greenheck Fan Corporation.
  2. Loren Cook Company.
  3. Aerovent; a division of Twin City Fan Companies, Ltd.
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
  1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
  1. Resiliently mounted to housing.
  2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
  3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
  4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
  5. Fan and motor isolated from exhaust airstream.
- E. Accessories:
  1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
  2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
  3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
  4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
  5. .
- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
  1. Configuration: Built-in cant and mounting flange.
  2. Overall Height: As required to maintain 12" above finish roof.
  3. Sound Curb: Curb with sound-absorbing insulation.
  4. Pitch Mounting: Manufacture curb for roof slope.
  5. Metal Liner: Galvanized steel.

## 2.3 CEILING-MOUNTED VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Loren Cook Company.
  - 3. Aerovent; a division of Twin City Fan Companies, Ltd.
- B. Housing: Steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- D. Grille: Plastic or painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- F. Accessories:
  - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
  - 2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
  - 3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
  - 4. Motion Sensor: Motion detector with adjustable shutoff timer.
  - 5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
  - 6. Filter: Washable aluminum to fit between fan and grille.
  - 7. Isolation: Rubber-in-shear vibration isolators.
  - 8. Manufacturer's standard roof jack or wall cap, and transition fittings.

## 2.4 IN-LINE CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Loren Cook Company.
  - 3. Aerovent; a division of Twin City Fan Companies, Ltd.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- F. Accessories:
  - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
  - 2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
  - 3. Companion Flanges: For inlet and outlet duct connections.
  - 4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
  - 5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
  - 6. Vibration Isolators:
    - a. Type: Spring hangers.
    - b. Static Deflection: 1 inch.

## 2.5 MOTORS

- A. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Enclosure Type: Totally enclosed, fan cooled.

## 2.6 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Equipment Mounting:



1. Install power ventilators on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in other sections.
  2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.
  - D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
  - E. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC."
  - F. Install units with clearances for service and maintenance.
  - G. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

### 3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 FIELD QUALITY CONTROL

- A. 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.
- B. Tests and Inspections:
  1. Verify that shipping, blocking, and bracing are removed.
  2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  5. Adjust belt tension.
  6. Adjust damper linkages for proper damper operation.
  7. Verify lubrication for bearings and other moving parts.
  8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
  10. Shut unit down and reconnect automatic temperature-control operators.
  11. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

### 3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

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. Round ceiling diffusers.
2. Modular core, square ceiling diffusers.
3. Perforated diffusers.
4. Linear bar diffusers.
5. Linear slot diffusers.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of 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.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

- B. Source quality-control reports.

## PART 2 - PRODUCTS

### 2.1 CEILING DIFFUSERS

#### A. Round Ceiling Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Price Industries.
  - b. Titus.
  - c. Anemostat Products; a Mestek company.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, color selected by Architect.
5. Face Style: Three cone.
6. Mounting: Duct connection.
7. Pattern: Two-position horizontal.

#### B. Modular Core, Square Ceiling Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Price Industries.
  - b. Titus.
  - c. Anemostat Products; a Mestek company.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, color selected by Architect.
5. Face Style: Modular Core.
6. Mounting: Surface.
7. Pattern: Adjustable.

#### C. Perforated Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Price Industries.
  - b. Titus.
  - c. Anemostat Products; a Mestek company.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, color selected by Architect.
5. Duct Inlet: Square.

6. Face Style: Flush.
7. Mounting: T-bar.
8. Pattern Controller: Adjustable with louvered pattern modules at inlet.

## 2.2 CEILING LINEAR SLOT OUTLETS

### A. Linear Bar Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Price Industries.
  - b. Titus.
  - c. Anemostat Products; a Mestek company.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, color selected by Architect.
5. Narrow Core Spacing Arrangement: 1/8-inch-thick blades spaced 1/4 inch apart, zero-degree deflection.
6. One-Way Deflection Vanes: Extruded construction fixed louvers with removable core.
7. Mounting: Concealed bracket.
8. Accessories: Blank-off strips.

### B. Linear Slot Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Price Industries.
  - b. Titus.
  - c. Anemostat Products; a Mestek company.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material - Shell: Aluminum.
4. Material - Pattern Controller: Steel.
5. Finish: Baked enamel, color selected by Architect.
6. Slot Width: As indicated on plans.
7. Number of Slots: As indicated on plans.
8. Length: As indicated on plans.

## 2.3 REGISTERS AND GRILLES

### A. Adjustable Bar Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Price Industries.
  - b. Titus.

- c. Anemostat Products; a Mestek company.
- 2. Material: Steel.
- 3. Finish: Baked enamel, color selected by Architect.
- 4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
- 5. Core Construction: Integral.
- 6. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
- 7. Mounting: Concealed.

## 2.4 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

### 3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 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 practical. 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.

### 3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

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. This Section includes the following:
  - 1. Gas-fired, condensing furnaces and accessories complete with controls.
  - 2. Air filters.
  - 3. Refrigeration components.

1.3 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each of the following:
  - 1. Furnace.
  - 2. Thermostat.
  - 3. Air filter.
  - 4. Refrigeration components.
- 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. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals for each of the following:
  - 1. Furnace and accessories complete with controls.
  - 2. Air filter.
  - 3. Air cleaner.

4. Ultraviolet germicidal light.
5. Humidifier.
6. Ventilation heat exchanger.
7. Refrigeration components.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Disposable Air Filters: Furnish two complete sets.
  2. Fan Belts: Furnish one set(s) for each furnace fan.

#### 1.7 QUALITY ASSURANCE

- A. 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.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. Comply with NFPA 70.

#### 1.8 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:
  1. Warranty Period, Commencing on Date of Substantial Completion:
    - a. Furnace Heat Exchanger: 10 years.
    - b. Integrated Ignition and Blower Control Circuit Board: Five years.
    - c. Draft-Inducer Motor: Five years.
    - d. Refrigeration Compressors: 10 years.
    - e. Evaporator and Condenser Coils: Five years.



## PART 2 - PRODUCTS

### 2.1 GAS-FIRED FURNACES, CONDENSING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Carrier Corporation; Div. of United Technologies Corp.
  - 2. Trane.
  - 3. Daikin.
- B. General Requirements for Gas-Fired, Condensing Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.
- C. Cabinet: Galvanized steel.
  - 1. Cabinet interior around heat exchanger shall be factory-installed insulation.
  - 2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
  - 3. Factory paint external cabinets in manufacturer's standard color.
  - 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.
  - 1. Fan Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - 2. Special Motor Features: Single speed, Premium (TM) efficiency, as defined in Section 230513 "Common Motor Requirements for HVAC Equipment," and with internal thermal protection and permanent lubrication.
  - 3. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.
  - 4. Special Motor Features: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.
- E. Type of Gas: Natural.
- F. Heat Exchanger:
  - 1. Primary: Stainless steel.
  - 2. Secondary: Stainless steel.
- G. Burner:
  - 1. Gas Valve: 100 percent safety two-stage main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
  - 2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.
- H. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
  2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
  3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.
- I. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.
- J. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories.
- K. Accessories:
1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.
  2. CPVC Plastic Vent Materials.
    - a. CPVC Plastic Pipe: Schedule 40, complying with ASTM F 441/F 441M.
    - b. CPVC Plastic Fittings: Schedule 40, complying with ASTM F 438, socket type.
    - c. CPVC Solvent Cement: ASTM F 493.
      - 1) CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      - 2) Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      - 3) Solvent cement and adhesive primer 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."

## 2.2 AIR FILTERS

- A. Disposable Filters: 1-inch- thick fiberglass media with ASHRAE 52.2 MERV rating of 8 or higher, in sheet metal frame.

## 2.3 REFRIGERATION COMPONENTS

- A. General Refrigeration Component Requirements:
1. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
  2. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Standard for Buildings except Low-Rise Residential Buildings."
- B. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment." Match size with furnace. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1.

1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.
- C. Refrigerant Piping: Comply with requirements in Section 232300 "Refrigerant Piping."
- D. Air-Cooled, Compressor-Condenser Unit:
1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
  2. Compressor: Hermetically sealed scroll type.
    - a. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
    - b. Two-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.
    - c. Refrigerant Charge: R-410A.
  3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
  4. Fan: Aluminum-propeller type, directly connected to motor.
  5. Motor: Permanently lubricated, with integral thermal-overload protection.
  6. Mounting Base: Polyethylene.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for gas and refrigerant piping systems to verify actual locations of piping connections before equipment installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.

1. Install seismic restraints to limit movement of furnace by resisting code-required seismic acceleration.
- C. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
1. Anchor furnace to substrate to resist code-required seismic acceleration.
- D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.
- E. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

### 3.3 CONNECTIONS

- A. Gas piping installation requirements are specified in Section 231123 "Facility Natural-Gas Piping. Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
    - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    - b. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
    - c. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
    - d. Requirements for Low-Emitting Materials:
      - 1) CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      - 2) PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      - 3) Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      - 4) Solvent cement and adhesive primer 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."

4. Slope pipe vent back to furnace or to outside terminal.
- D. Vent Connections, Oil-Fired Furnaces: Connect Type L vents to furnace vent connection and extend outdoors. Type L vents and their installation requirements are specified in Section 235100 "Breechings, Chimneys, and Stacks"
- E. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."
- F. Comply with requirements in Section 232300 "Refrigerant Piping" for installation and joint construction of refrigerant piping.

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  1. Perform electrical test and visual and mechanical inspection.
  2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
  3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
  4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
  5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

### 3.5 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
  1. Inspect for physical damage to unit casings.
  2. Verify that access doors move freely and are weathertight.
  3. Clean units and inspect for construction debris.
  4. Verify that all bolts and screws are tight.
  5. Adjust vibration isolation and flexible connections.
  6. Verify that controls are connected and operational.
- B. Adjust fan belts to proper alignment and tension.
- C. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.
- D. Measure and record airflows.

- E. Verify proper operation of capacity control device.
- F. After startup and performance test, lubricate bearings and adjust belt tension.

### 3.6 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

### 3.7 CLEANING

- A. After completing installation, clean furnaces internally according to manufacturer's written instructions.
- B. Install new filters in each furnace within 14 days after Substantial Completion.

### 3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 017900 "Demonstration and Training."

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 split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. LEED Submittals:
  - 1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

## 1.6 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. Filters: One set for each air-handling unit.
  - 2. Gaskets: One set for each access door.
  - 3. Fan Belts: One set for each air-handling unit fan.

## 1.7 QUALITY ASSURANCE

- 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. ASHRAE Compliance:
  - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
  - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

## 1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period:
    - a. For Compressor: Five year(s) from date of Substantial Completion.
    - b. For Parts: One year from date of Substantial Completion.
    - c. For Labor: One year from date of Substantial Completion.



## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
  2. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
  3. Trane; a business of American Standard companies.
  4. YORK; a Johnson Controls company.

### 2.2 INDOOR UNITS (5 TONS OR LESS)

- A. Concealed Evaporator-Fan Components:
1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
  2. Insulation: Faced, glass-fiber duct liner.
  3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
  4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
  5. Fan Motors:
    - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
  6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
  7. Filters: Permanent, cleanable.
  8. Condensate Drain Pans:
    - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
      - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
      - 2) Depth: A minimum of 2 inches deep.
    - b. Single-wall, galvanized-steel sheet.
    - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
      - 1) Minimum Connection Size: NPS 1.

- d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
- e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

B. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:
  - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
  - c. Enclosure Type: Totally enclosed, fan cooled.
  - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
  - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
  - f. Mount unit-mounted disconnect switches on exterior of unit.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Filters: Permanent, cleanable.
7. Condensate Drain Pans:
  - a. Fabricated with **one** percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
    - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
    - 2) Depth: A minimum of 1 inch deep.
  - b. Single-wall, galvanized-steel sheet.
  - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
    - 1) Minimum Connection Size: NPS 1.
  - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

## 2.3 INDOOR UNITS (6 TONS OR MORE)

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.
5. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
6. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
7. Fan Motors:
  - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
  - c. Three-phase, permanently lubricated, ball-bearing motors with built-in thermal-overload protection.
  - d. Wiring Terminations: Connect motor to chassis wiring with plug connection.
8. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
9. Filters: 1 inch thick, in fiberboard frames.
10. Condensate Drain Pans:
  - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
    - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
    - 2) Depth: A minimum of 2 inches deep.
  - b. Single-wall, galvanized-steel sheet.
  - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
    - 1) Minimum Connection Size: NPS 1.
  - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
  - e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

## 2.4 OUTDOOR UNITS (5 TONS OR LESS)

### A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - a. Compressor Type: Scroll.
  - b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
  - c. Refrigerant Charge: R-410A.
  - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

## 2.5 OUTDOOR UNITS (6 TONS OR MORE)

### A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - a. Compressor Type: Scroll.
  - b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
  - c. Refrigerant Charge: R-410A.
  - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

## 2.6 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence and Operations for HVAC Controls."
- B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
  - 1. Compressor time delay.
  - 2. 24-hour time control of system stop and start.
  - 3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
  - 4. Fan-speed selection including auto setting.
- C. Automatic-reset timer to prevent rapid cycling of compressor.
- D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- E. Drain Hose: For condensate.
- F. Additional Monitoring:
  - 1. Monitor constant and variable motor loads.
  - 2. Monitor variable-frequency-drive operation.
  - 3. Monitor economizer cycle.
  - 4. Monitor cooling load.
  - 5. Monitor air distribution static pressure and ventilation air volumes.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- D. Equipment Mounting:
  - 1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in other sections.
  - 2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.

3. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
  4. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. 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.
- C. Tests and Inspections:
1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

### 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This specification shall apply to all phases of Work hereinafter specified, shown on Drawings, or as required to provide a complete installation of electrical systems for this Project. Work required under this specification, is not limited to just the Electrical Drawings - refer to Architectural, Structural, Landscape, and Mechanical / Plumbing Drawings, as well as all other drawings applicable to this project, which designate the scope of work to be accomplished. The intent of the Drawings and Specifications is to provide a complete and operable electrical system that includes all documents that are a part of the Contract.
1. Work Included. Furnish labor, material, services and skilled supervision necessary for the construction, erection, installation, connections, testing, and adjustment of all circuits and electrical equipment specified herein, or shown or noted on Drawings, and its delivery to the Owner complete in all respects ready for use.
  2. The electrical Work includes installation or connection of certain materials and equipment furnished by others. Verify installation details, installation and rough-in locations from the actual equipment or from the equipment shop drawings.
- B. Electrical Drawings. Electrical Drawings are diagrammatic, and are intended to convey the scope of work, indicating intended general arrangement of equipment, conduit and outlets. Follow Drawings in laying out Work and verify spaces for installation of materials and equipment based on actual dimensions of equipment furnished.

1.02 QUALITY ASSURANCE

- A. Design, manufacture, testing and method of installation of all apparatus and materials furnished under requirements of these specifications shall conform to latest publications or standard rules of the following:
- Institute of Electrical and Electronic Engineers - IEEE
  - National Electrical Manufacturers' Association - NEMA
  - Underwriters' Laboratories, Inc. - UL
  - National Fire Protection Association - NFPA
  - Federal Specifications - Fed. Spec.
  - American Society for Testing and Materials - ASTM
  - American National Standards Institute - ANSI
  - National Electrical Code - NEC
  - National Electrical Safety Code - NESC
  - Insulated Cable Engineers Association - ICEA
  - American Institute of Steel Construction - AISC

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- State and Municipal Codes In Force In The Specific Project Area
  - Occupational Safety and Health Administration (OSHA)
  - Electronics Industries Association/ Telecommunications Industry Association (EIA/TIA)
  - California Electrical Code (where adopted)
  - Local Authority Having Jurisdiction (AHJ) Published Electrical Standards and Codes
- B. Perform Work in accordance with the National Electrical Code, applicable building ordinances, and other applicable codes, hereinafter referred to as the "Code." The Contractor shall comply with the Code including local amendments and interpretations without added cost to the Owner. Where Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply unless variance is approved.
1. Comply with all requirements for permits, licenses, fees and codes. Permits, licenses, fees, special service costs, inspections and arrangements required for the Contractor at his expense shall obtain Work under this contract, unless otherwise specified.
  2. Comply with requirements of the applicable utility companies serving this Project. Make all arrangements with utility companies for proper coordination of Work.

### 1.03 GENERAL REQUIREMENTS

- A. Guarantee: Furnish a written guarantee for a period of one-year from date of acceptance.
- B. Wherever a discrepancy in quantity or size of conduit, wire, equipment, devices, circuit breakers, etc., (all materials), arises on the Drawing and/or Specifications, the Contractor shall be responsible for providing and installing all material and services required by the strictest condition noted on Drawings and/or in Specifications to ensure complete and operable systems as required by the Owner and Engineer.
- C. All Core Cutting, Drilling, and Patching:
1. For the installation of work under this Section, the aforementioned shall be performed under this Section of the Specifications and the Concrete section of the Specifications.
  2. No holes will be allowed in any structural members without the written approval of the Project's Structural Engineer.
  3. For penetrations of concrete slabs or concrete footings, the work shall be as directed in the Concrete Section of Specifications.
  4. The contractor shall be responsible for patching and repairing surfaces where he is required to penetrate for work under this contract.
  5. Penetrations shall be sealed to meet the rated integrity of the surface required to be patched and repaired. The patched surface shall be painted or finished to match the existing surface.
- D. Verifying Drawings and Job Conditions:

1. This Contractor shall examine all Drawings and Specifications in a manner to be fully cognizant of all work required under this Section.
2. This Contractor shall visit the site and verify existing conditions. Where existing conditions differ from Drawings, adjustment shall be made and allowances included for all necessary equipment to complete all parts of the Drawings and Specifications.

#### 1.04 WORK IN COOPERATION WITH OTHER TRADES

- A. Examine the Drawings and Specifications and determine the work to be performed by the electrical, mechanical and other trades. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, disconnects, relays, and other devices for the required operation sequence of all electrical, mechanical and other systems or equipment.
- B. Provide a conduit only system for low voltage wiring required for control of mechanical and plumbing equipment described in this or other parts of the Contract Documents. Install all control housings, conduits and backboxes required for installing conductors and wire to the controls.
- C. Install separate conduits between each heating, ventilating and air conditioning sensing device and its control panel and/or control motor. Before installing any conduit for heating, ventilating and air conditioning control wiring, verify the exact requirements from the control diagrams provided with the equipment manufacturer's shop drawings.

#### 1.05 TESTING AND ADJUSTMENT

- A. Upon completion of all electrical work, this Contractor shall test all circuits, switches, motors, breakers, motor starter(s) and their auxiliary circuits and any other electrical items to ensure perfect operation of all electrical equipment.
- B. Equipment and parts in need of correction and discovered during such testing, shall be immediately repaired or replaced with all new equipment and that part of the system shall then be retested. All such replacement or repair shall be done at no additional cost to the Owner.
- C. All circuits shall be tested for continuity and circuit integrity. Adjustments shall be made for circuits not complying with testing criteria.
- D. All certified testing reports should be submitted to the Engineer at completion of project.

#### 1.06 IDENTIFICATION

- A. Identification nameplates shall be Micarta 1/8" thick and of approved size, with beveled edges and engraved white letters 1/4" high minimum on black background. Nameplates shall be provided for all circuits in the distribution switchboards, and selector switches. Provide nameplates on all switchboards, panelboards and transformers to correlate with the Single Line Diagram. Inscriptions on equipment shall be identical to those indicated in panels and/or motor control centers and

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other similar devices. Each nameplate shall be attached to the equipment by epoxy. The inscriptions in each nameplate shall be as indicated on the Drawings.

- B. Identification of Air Conditioning Equipment: Equipment to be so identified shall include, but shall not be limited to: switches; starters/controllers; motors and boxes or cans housing other control items. Nameplates shall have letters a minimum of 3/8" high.
- C. Plates: All cover and device plates shall be furnished with engraved or etched designations under any one of the following conditions:
  - 1. Three gang or larger gang switches.
  - 2. Lock switches.
  - 3. Pilot light switches.
  - 4. Switches in locations from which the equipment or circuits controlled cannot be readily seen.
  - 5. Manual motor starting switches.
  - 6. Switches that serve other than lighting loads.
  - 7. Where so indicated on the drawings.
  - 8. As required on all control circuit switches, such as heater controls, etc.
  - 9. Where receptacles are other than standard duplex receptacles to indicate voltage and phase.
- D. See wiring device section of this specification for wiring device plate cover labeling requirements.
- E. See drawings for panel board schedule directory requirements.
- F. See conduit installation section of this specification for conduit labeling requirements.

#### 1.07 FINAL INSPECTION AND ACCEPTANCE

- A. After all requirements of the Specifications and/or the Drawings have been fully completed, representatives of the Owner will inspect the work. Contractor shall provide competent personnel to demonstrate the operation of any item or system to the full satisfaction of each representative.
- B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.
- C. Prepare the following items and submit to the Architect before final acceptance:
  - 1. Two (2) copies of all test results as required under this section.
  - 2. Two (2) copies of local and/or state codes enforcing authority's final inspection certificates.
  - 3. Copies of as-built record drawings as required under the General Conditions, pertinent Division One sections and Basic Electrical Requirements.
  - 4. Two (2) copies of all receipts transferring portable or detachable parts to the District when requested.
  - 5. Notify the Architect in writing when installation is complete and that a

- final inspection of this work can be performed. In the event any defect or deficiencies are found during this final inspection, they shall be corrected to the satisfaction of the Architect before final acceptance can be issued.
6. Two (2) copies of the as-built/existing conditions site plan.

D. The Contractor shall complete the following work before any electrical equipment is energized.

1. All equipment shall be permanently anchored.
2. All bus connections shall be tightened per manufacturer's instructions and witnessed by the Owner's representative or inspector.
3. All ground connections shall be completed and identified. Perform and successfully complete all required megger and ground resistance tests.
4. All feeders shall be connected and identified.
5. The interiors of all electrical enclosures including busbars and wiring terminals shall be cleaned of all loose material and debris, paint, plaster, cleaners or other abrasive's overspray removed and equipment vacuumed clean. The Owner's Representative or inspector shall observe all interiors before covers are installed.
6. All dry wall work and painting shall be completed within the main electrical room.
7. All doors to electrical equipment rooms shall be provided with locks in order to restrict access to energized equipment.
8. Electrical rooms shall not be used as a storage room after power is energized.
9. The coordination study for the power distribution system shall be complete, circuit breakers ground relays set, tested and calibrated accordingly.

#### 1.08 RECORD DRAWINGS

- A. Drawings of Record: The Contractor shall provide and keep up-to-date, a complete record set of blueprints. These shall be corrected daily and show every change from the original Drawings. This set of prints 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, a set of reproducible Contract Drawings shall be obtained from the General Contractor and all changes as noted on the record set of prints shall be incorporated thereon with black ink in a neat, legible, understandable and professional manner. Refer to the Supplementary General Conditions for complete requirements.

#### 1.09 APPROVALS, EQUALS, SUBSTITUTIONS, ALTERNATIVES, NO KNOWN EQUAL

- A. Approvals: Where the words (or similar terms) "approved", "approval", "acceptable", and "acceptance" are used, it shall be understood that acceptance by the Owner, Architect and Engineer are required.
- B. Equal: Where the words (or similar terms) "equal", "approved equal", "equal to", "or equal by", "or equal" and "equivalent" are used, it shall be understood that these words are followed by the expression "in the opinion of the Owner, Architect, and Engineer. For the purposes of specifying products, the above words shall indicated the same size, made of the same construction materials, manufactured

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with equivalent life expectancy, having the same aesthetic appearance / style (includes craftsmanship, physical attributes, color and finish), and the same performance.

- C. Substitution: For the purposes of specifying products "substitution" shall refer to the submittal of a product not explicitly approved by the construction documents / specifications.
1. Substitutions of specified equipment shall be submitted and received by the Engineer ten (10) days prior to the bid date for review and written approval. Regulatory Agency approval for all substitutions will be the sole responsibility of the contractor. To receive consideration, requests for substitutions must be accompanied by documentary proof of its equality with the specified material. Documentary proof shall be in letterform and identify the specified values/materials alongside proposed equal values/materials. In addition, catalog brochures and samples, if requested, must be included in the submittal. ONLY PRE-BID APPROVED PRODUCTS, ISSUED VIA A FORMAL BID ADDENDUM TO ALL BIDDERS, WILL BE ALLOWED ON THE PROJECT. REGARDLESS OF THE APPROVAL ON ANY SUBSTITUTION, ALL BIDS SHALL BE BASED ON THE PRODUCTS EXACTLY AS SPECIFIED. PRICING FOR EACH APPROVED SUBSTITUTION SHALL BE INCLUDED IN THE BID SUBMITTAL AS A SEPARATE LINE ITEM.
  2. In the event that written authorization is given for a substitution, after award of contract, the Contractor shall submit to the Engineer quotations from suppliers / distributors of both the specified and proposed equal material for price comparison, as well as a verification of delivery dates that conform to the project schedule.
  3. In the event of cost reduction, the Owner will be credited with 100 percent of the reduction, arranged by Change Order.
  4. The Contractor warrants that substitutions proposed for specified items will fully perform the functions required.
- D. Alternates \ Alternatives: For the purposes of specifying products, "alternatives / alternates" may be established to enable the Owner / Architect / Engineer to compare costs where alternative materials or methods might be used. An alternate price shall be submitted in addition to the base bid for consideration. If the alternate is deemed acceptable, written authorization will be issued.
- E. No Known Equal: For the purposes of specifying products, "No Known Equal" shall mean that the Owner / Architect / Engineer is not aware of an equivalent product. The Contractor will need to submit a "Substitution" item, per the requirements listed above, if a different product is proposed to be utilized.

#### 1.10 SHOP DRAWINGS / SUBMITTALS

- A. Shop Drawings / Submittals shall be submitted in six (6) bound sets accompanied by Letter of Transmittal, which shall give a list of the number and dates of the drawings submitted. Drawings shall be complete in every respect and bound in sets.
- B. The Shop Drawings / Submittals submitted shall be marked with the name of the project, numbered consecutively and bear the approval of the Contractor as evidence that the Contractor has checked the Drawings. Any Drawings submitted

without this approval will be returned to the Contractor for resubmission.

- C. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in his letter of transmittal. If the substitution is accepted, the Contractor shall be responsible for proper adjustment that may be caused by the substitution. Samples shall be submitted when requested.
- D. Only products listed as "Equal" within the contract documents, along with formally approved "Substitutions" will be reviewed. Products not conforming to these items will not be reviewed and will be returned to the Contractor for re-submittal.
- E. Review comments used in response to shop drawings / submittals are:
- "No Exception Taken" Product approved as submitted.
  - "Furnish As Corrected" Re-submittal not required, although the contractor is to provide the submitted product with corrections as noted.
  - "Revise And Resubmit" Re-submittal required with corrections as noted.
  - "Rejected" Re-submittal required based upon the originally specified product.
- F. Shop drawings shall be submitted on the following but not limited to:
- Lighting fixtures.
  - Switchgear / Distribution Boards, Motor Control Centers and Panelboards complete with overcurrent device information.
  - Transformers.
  - Fire alarm System/Central Monitoring System.
  - Wiring Devices.
  - Lighting Control System / Dimming System Products.
  - Pullboxes and Underground Vaults
  - Terminal Cabinets
  - Lighting Inverters, UPS's, PDU's, Generators, ATS's, Inverters, TVSS Systems
  - Cable Tray, Flexible Cable tray and Cable Runway
  - Power Poles and Floor Boxes
  - Coordination Study
  - All other products called out on drawings that call for shop drawing submittal.

#### 1.11 MAINTENANCE, SERVICING, INSTRUCTION MANUALS AND WIRING DIAGRAMS

- A. Prior to final acceptance of the job, the Electrical Contractor shall furnish to the Owner at least six (6) copies of operating and maintenance and servicing instructions, as well as six (6) complete wiring diagrams for the following item(s) or equipment:
- Lighting Control System / Dimming Systems.
  - Fire alarm system.
  - Transformers.
  - Panelboards.

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- Switchgear / Distribution Boards.
  - Lighting Inverters, UPS's, PDU's, Generators, ATS's, Inverters, TVSS Systems
- B. All wiring diagrams shall specifically cover the system supplied. Typical drawings will not be accepted. Four (4) copies shall be presented to the Owner.

#### 1.12 INTERRUPTION OF SERVICE OR SERVICE SHUTDOWN:

- A. All electrical services in all occupied facilities of the contract work are to remain operational during the entire contract period. Any interruption of the electrical power for the performance of this work shall be at the convenience of the District and performed only after consultation with the District. Work involving circuit outages shall be only at such a time and of such duration as approved in writing. Work involving power outages for the work required to connect new equipment and disconnect existing equipment shall be performed at the convenience of the District.
- B. Work involving system outages to the building data, fire alarm, intrusion detection, telephone, computer, intercommunications, energy management, television, or clock systems shall be performed only after consultation with the District and shall be only at such a time and of such duration as approved in writing.
- C. Provide overtime work, double shift work, night time work, Saturday, Sunday, and holiday work to meet outages schedule.
- D. Provide temporary electrical power to meet the requirements of this Article.
- E. Any added costs to the contractor due to necessity of complying with this Article shall be included in the Contract scope of work.
- F. When electrical work involving power disruptions to existing areas is initiated, the work shall proceed on a continuous basis without stopping until electric power is restored to the affected areas.
- G. The Contractor shall request in writing to the District a minimum of three weeks in advance for any proposed electrical outage.

#### 1.13 POWER, TELEPHONE AND OTHER SERVICES

##### A. GENERAL

1. Power and metering facilities shall conform to the requirements of the serving utility companies. Contractor shall verify service locations and requirements prior to bid.
2. Conform to all requirements of the serving utility companies. Locations of structures and routing of service conduits indicated on the drawings are approximate and shall be verified with the serving utility company prior to installation. Installation of service shall not begin until approved drawings have been received from the serving utility company.

3. Within 30 calendar days of receipt of notice that the contract has been awarded, the Contractor shall notify the New Business Departments of the District Office of the serving utility companies and shall provide information as requested by the serving utility company. The Contractor shall furnish at the same time information as to the estimated completion date of job or the date when the respective utility company circuits, will be ready for installation, energizing and activation of the service.
4. In addition to the requirements of the serving utility companies, all power, telephone and cable service conduits for utility companies shall be completely encased with concrete.
5. Perform all work for electric power, cable television and public telephone services in accordance with the requirements of said companies and/or city departments. Services shall be complete to the point of connection as designated by the serving utility company.
6. Prior to bid date, Contractor shall consult utility company and verify all service locations, utility company and/or city requirements. Include costs in the bid for all work required.
7. Coordinate hook-up of final service with utility company or city so as to cause no delay in the progress of the work. Include the cost of overtime, off-hours and weekend work as may be required.
8. Notify the Architect immediately of any major changes required to the work of this section as a result of said utility company and/or city requirements.
9. Interrupting capacity of the main circuit breaker and distribution circuit breakers shall be equal to or greater than available short circuit current at said point as obtained by utility company or as computed by the Engineer. Selective coordination between main and feeder circuit breakers is required.

B. INSTALLATION

1. Service conduits shall terminate at service poles or other service points as indicated by the serving utility company and shall extend underground to main service terminating pull section as indicated. All bends in conduits shall be long radius type and all sweeps shall have a radius of not less than 10 times conduit trade size. Underground conduits shall be encased in concrete 3" thick on all sides with multiple conduits spaced not less than 1-1/2" apart.
2. Service cable, if overhead, shall be connected to metering compartment of switchboard or, if underground, in service terminating pull section as required and directed by utility company.
3. Provide grounding/bonding including ground rods at utility service equipment per serving utility company requirements.

C. STRUCTURAL CONDITIONS

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1. Where conduits are to pass through or interfere with any structural member, where notching, boring or cutting of structure is necessary, where special openings are required through walls, floors, footings, or other building elements, to accommodate electrical work, all such work shall be done as directed and approved by Architect/Structural Engineer of Record.
2. Placement of conduits in concrete slabs and structural members shall comply with requirements of applicable section of CCR, Title 24, Public Works and shall be approved by the Architect.
3. Where a concrete encasement for underground conduits abuts a foundation wall or underground structure which conduits enter, encasement shall be maintained in position in relation to structure, or shall extend down to footing projection, or shall be doweled into structure. Underground structures shall include manholes, pull boxes, vaults and buildings.
4. All cutting and patching of rough and finish construction work shall be done as required for installation of work under this section. Patching shall be of same materials, workmanship and finish and shall accurately match the surrounding work. Work shall be done under direction of the architect.

#### 1.12 PERMITS, FEES AND INSPECTIONS

- A. Obtain and pay for all permits and licenses required for the electrical work, and arrange and schedule all required inspections. Obtain permits prior to commencing any work.
- B. Pay all fees or charges levied by the utility company or city for permanent and temporary services to the project, and any other imposed fees.

#### 1.13 BELOW GRADE UTILITY DETECTION

- A. The Contractor shall obtain the services of a company engaged in the business of detection of existing below grade utilities to identify and document existing utilities in the areas of the new work. Services shall be provided utilizing the latest detection equipment available. The company obtained shall have been engaged in the business of below grade utility detection for the past five years. Services are available from Underground Technology Incorporated at (800) 366-7801.
- B. Existing below grade utilities and their locations may or may not be indicated by these documents or may be partially indicated at what is believed to be the approximate location(s). The information has not been independently verified by the District or the District's Representatives. The Architect and the Architect's Consulting Engineers are not responsible for the locations of existing below grade utilities and the accuracy of said information. The Contractor shall verify and identify the existing utilities in the areas of the new work and take the necessary steps to avoid damage to existing utilities. In addition, the Contractor shall identify existing said below grade utilities and formulate the best trenching route(s) for the new installation. No trenching/excavation shall take place until this has been verified.

- C. In conjunction with the below grade utility detection, the Contractor shall prepare and provide a scaled site plan indicating the locations of all below grade utilities encountered and identified. The "as-built/existing condition" site plan shall be turned over to the District as part of the Close-out package.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Materials and Equipment: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety.
- B. Switchboards / Distribution Boards / Motor Control Centers:
  - 1. See general single line notes on single line drawing for more information.
- C. Panel boards - Branch Circuit:
  - 1. See drawings for panel board schedules and specifications.
- D. Transformers:
  - 1. See drawings for transformer schedules and specifications.
- E. Lighting Fixtures:
  - 1. See drawings for lighting fixture and lamp schedules and additional specifications. Furnish, install and connect a lighting fixture at each outlet where a lighting fixture type symbol (designated on plans) is shown as being installed. Each fixture shall be complete with all required accessories including sockets, glassware, boxes, spacers, mounting devices, fire rating enclosure and lamps.
  - 2. Ballasts: See lighting fixture schedule notes. All noisy ballasts shall be replaced at no cost to the Owner.
  - 3. Sockets shall be General Electric, Bryant, or equal, white, twist-turn contact type. Push contact type sockets will not be allowed.
  - 4. Lamps: See lamp / fixture schedule and lamp / lighting fixture schedule notes.
  - 5. Fixtures shall be furnished and installed with required mounting devices and accessories.

general electrical requirements

6. All lighting shall be individually supported and properly anchored to roof or floor above.
7. Locations of fixtures shall be per the architectural reflected ceiling plan and shall be coordinated at time of rough in. Conflicts between the architectural reflected ceiling plan and the electrical plans shall be brought to the attention of the Architect, in writing, prior to ordering fixtures.

F. Wiring Devices:

1. Provide wiring devices indicated per plan. Devices shall be specification grade. Acceptable manufactures are Leviton, Pass & Seymour and Hubbell. Provide all similar devices of same manufacturer, unless indicated otherwise. All device colors shall be from the full range of manufacturer standard color options as selected by the architect. This selection will be made during the shop drawing review process. Convenience receptacles shall be 20 Amp (not 15 Amp).

2. Wiring Devices (Decora)

Receptacle #16352- WHITE

I.G. Receptacle#16362-IG- WHITE

G.F.C.I. Receptacle #6899- WHITE

Simplex Receptacle #16351- WHITE

Recessed Clock Receptacle #5361-CH- WHITE (Non-Decora)

Single Pole Switch #5691-2- WHITE

Double Pole Switch #5692-2- WHITE

Three Way Switch #5623-2- WHITE

Four Way Switch #5624-2- WHITE

Pilot Light Switch "On" #5628-2- WHITE

Pilot Light Switch "Off" #5631-2- WHITE

Projection Screen Switch #5657-2- WHITE

Keyed Switch #1221-2L WHITE (Non-Decora)

Door Jam Switch #1865-BRASS

3. I.G. (isolated ground) receptacle bodies shall be of a basic color specified above with an orange triangle to symbolize isolated ground.
4. When shown circuited with an I.G. conductor, receptacles shall be of an I.G. type. As an example, a NEMA L6-30R denoted on the plans and shown circuited with an I.G. conductor shall be an I.G. version of that receptacle.
5. Wiring devices located in wood finished areas shall generally be black unless otherwise indicated by the architect.
6. Wiring devices shall generally be white with stainless steel cover plates unless otherwise indicated by the Architect.
7. All wiring device plates on the project shall be labeled with panel and circuit number(s) utilizing a Brother P-Touch labeling system utilizing 1/2" tape (yellow on black) or equal by Herman-Tellerman or Panduit. Locate label

on the concealed side of the wiring device plate. Handwritten labels are unacceptable.

8. The following device plates shall be engraved:

- a. Key operated switches, switches with Pilot Lights and Switches for the control of motors, heaters and ventilators. Engraving shall be black and occur on the exposed side of the plate and indicate the motor, heater, or ventilator controlled.
- b. Receptacles on generator and/or UPS power shall have custom stamped plates with the words "generator" or "UPS" in black letters.

9. Weatherproof Outlet Covers/Assemblies. All Receptacles identified as weatherproof on the drawings shall be GFCI type and equipped as follows:

- a. Subscript WP-A: Recessed wall box, 6" x 6"x 3 1/2" deep, with a hinged, lockable, cast aluminum, self-closing, gasket-equipped door that is wet location-listed Raintight while "in use". Unit shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). C.W. Cole TL-310 Series with an interior metal plate suitable for a GFCI receptacle in one compartment separated from a second compartment with a metal separation barrier. The second compartment shall have a blank metal plate suitable for field installation of power, AV or communications devices. This compartment shall have a minimum 3/4" C.O. with pull string routed from the box to the facility telephone backboard unless otherwise noted on the drawings. Provide 1 key minimum per device to the Owner's project manager upon completion of project. Contractor to field paint custom color as selected by architect.
- b. Subscript WP-B: Wet location-listed Raintight while "in use" cast copper-free aluminum lockable cover with baked aluminum lacquer finish and one gang GFCI receptacle. Hubbell WP26M series. Polycarbonate covers are unacceptable. Unit shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). Contractor to field paint custom color as selected by Architect.
- c. Subscript WP-C: BK Lighting #CUS-1204-33 with raintight while "in use" cast copper-free aluminum lockable cover with baked aluminum lacquer finish and one gang GFI receptacle. Hubbell WP26M series. Polycarbonate covers are unacceptable. Wet location-listed weatherproof cover shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). Contractor to provide custom color by manufacturer as selected by Architect. Mount housing to BK Lighting "power pipe" underground junction box. See drawings for additional details.

G. Motor Controllers / Starters: See drawings for motorized equipment schedules and specifications.

H. Circuit Breakers:

1. Service entrance circuit breakers smaller than 400 Amp frame shall be thermal-magnetic trip with inverse time current characteristics unless otherwise indicated below. Service entrance main circuit breakers, 400

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Amp frame and larger shall be 100% rated, solid-state type as outlined in this specification. All other service entrance circuit breakers, 400 Amp frame and larger, shall be 100% rated, solid-state type outlined in this specification.

2. All non-service entrance circuit breakers 225 Amp and larger shall be thermal magnetic type and have continuously adjustable magnetic pick-ups of approximately 5 to 10 times trip rating. Breakers shall have easily changed trip rating plugs with trip ratings as indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames. Additionally, all non-service entrance circuit breakers, 600 Amp frame and larger, located in 480v 3 phase, 3-wire or 277/480v, 3 phase 4-wire switchgear, distribution boards or panel boards, shall be solid state, 100% rated. Breaker shall have built-in test points for testing long delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120-volt operated test kit. Contractor to provide the use of a test kit capable of testing all breakers 400 Amp and above - at the Engineers request.
3. All non-service entrance circuit breakers less than 225 Amp shall be molded plastic case, air circuit breakers conforming to UL 489. Provide breakers with thermal magnetic trip units, and a common trip bar for two- or three-pole breakers, connected internally to each pole so tripping of one pole will automatically trip all poles of each breaker. Provide breakers of trip-free and trip-indicating bolt-on type, with quick-make, quick-break contacts. Provide single two- or three-pole breaker interchangeability. Provide padlocking device for circuit breakers as shown on the Drawings.
4. Where a Current Limiting Circuit Breaker (CLCB) is indicated on drawings or as required elsewhere in this specification, provide a U.L. listed current limiting thermal magnetic circuit breaker(s) u.o.n. An independently operating limiter section within a molded case is not allowed. Coordinate CLCB ratings as required to protect electrical system components on the load side of the CLCB to include, but not limited to, protecting automatic transfer switches, panel boards and lighting control panels.
5. Where a solid-state circuit breaker is indicated on drawings or as required elsewhere in this specification, provide a solid-state circuit breaker with minimum five function complete with built-in current transformers. The five functions shall be independently adjustable and consist of Overload/Long Time Amp Rating, Long Time Delay, Short Time Delay, Short Circuit/Instantaneous Pickup, but may also include Shunt Trip and/or Ground Fault if so indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames. Breaker shall have built-in test points for testing long delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120-volt operated test kit. Contractor to provide the use of a test kit capable of testing all breakers 400 Amp and above - at the Engineers request.
6. Ground Fault Interrupting Breakers. Provide where shown molded plastic case, air circuit breakers, similar to above with ground fault circuit interrupt capability, conforming to UL Class A, Group 1.

7. Tandem or half-sized circuit breakers are not permitted.
  8. Series Rated Breakers. UL listed series rated combinations of breakers can be used to obtain panelboard-interrupting ratings shown on Drawings. If series rated breakers are used, switchboards, distribution boards and panel boards shall be appropriately labeled to indicate the use of series rated breakers. Shop drawing submittal shall include chart of U.L. listed devices, which coordinate to provide series rating.
  9. Circuit breakers shall be standard interrupting construction. Panelboard shall accept standard circuit breakers up to 225 amperes. Provide HACR ratings for all circuit breakers serving motor loads.
  10. Circuit breaker handle accessories shall provide provisions for locking handle in the on or off position.
  11. Shunt trip equipped circuit breakers shall be provided on all elevator feeders.
  12. Temperature compensating circuit breaker(s) shall be provided when located in outdoor enclosure(s) or when located in an enclosure subject to high ambient heat due to due nearby industrial processes etc.
  13. Provide 75 degree Celsius-rated conductor lugs/lug kits as required on all circuit breakers to accept conductor quantities and sizes shown on drawings.
  14. All circuit breaker terminations shall be suitable for use with 75 degrees Celsius ampacity conductors.
- I. Disconnect Switches:
1. Non-fusible or fusible, heavy-duty, externally operated horsepower-rated, 600V A.C. Provide NEMA 3R, lockable enclosures for all switches located on rooftops, in wet or damp areas and in any area exposed to the elements.
  2. Fusible switches shall be Class "R".
  3. Amperage, Horsepower, Voltage and number of pole per drawings. All of which shall be clearly marked on the switch nameplate.
  4. Provide the Owner's project manager with one spare set of fuses and two sets of fuse clips/fuse for every set of fuses on the project.
- J. Fuses:
1. Provide fuses at all locations shown on the Drawings and as required for supplemental protection.
    - a. Fuses shall be manufactured by Bussman, Shawmut, or equal.
    - b. All fuses shall be the product of a single manufacturer.

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2. Main and Feeder Protection.

- a. Where rating of protective device is greater than 600A, provide Bussman Hi-Cap fuses, Class L, current limiting, having an interrupting rating of 200,000A RMS.
- b. Where rating of protective device is 600A or less, provide Bussman Class R fuses, Class RK1 current limiting fuses, having an interrupting rating of 200,000A RMS.

3. Motor Protection.

- a. Where rating of protective device is 600A or less, provide Bussman Low-Peak, Class RK1 Dual-element, current-limiting fuses having an interrupting rating of 200,000A RMS.
- b. Where rating of protective device is 600A or less, provide Bussman Fusetron Dual-Element fuses, Class RK5, having an interrupting rating of 200,000A RMS.
- c. Where fuses feeding motors are indicated but not sized, it shall be the responsibility of the Contractor to coordinate the fuse size with the motor to provide proper motor running protection.
- d. When rejection type fuses are specified (Class RK1 or RK5) the fuse holder of all switches (specified in other Sections) shall be suitable for the fuses provided.

K. Cable Tray, Flexible Cable Tray and/or Cable Runway:

- 1. See drawings for Cable Tray, Flexible Cable Tray and/or Cable Runway specifications.

L. Lighting Control Systems:

- 1. See drawings for Lighting Control Systems schedules and specifications.
- 2. See drawings for occupancy sensors and photosensors.

M. Conduit:

- 1. Galvanized Rigid Conduit (GRC) shall be full weight threaded type steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing, or sherardizing process.
- 2. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242 and meeting Federal Specification WWC-581 (latest revision).
- 3. Electrical Metallic Tubing (EMT) shall be zinc-coated steel with baked enamel or plastic finish on inside surfaces. EMT shall be dipped in a chromic acid bath to chemically form a corrosion-resistant protective coating of zinc chromate over galvanized surface.
- 4. Flexible metal conduit shall be constructed of hot-dipped galvanized steel

strips wound spirally with interlocking edges to provide greatest flexibility with maximum strength. Interior surfaces shall be smooth and offer minimum drag to pulling in conductors. Use only as directed in writing by the Engineer with the exception of 400 Hz feeders and 400 Hz branch circuits which shall be run in flexible aluminum conduit.

5. Liquid-tight conduit (Seal-Tite) shall be galvanized steel flexible conduit as above except with moisture and oil-proof jacket, pre-cut lengths and factory-installed fittings. For outdoor installations and motor connections only unless otherwise noted on drawings.
6. Factory assembled, or off-site assembled wiring systems (such as Metal Clad (MC) Cable, Type AC Cable, Type NM Cable, Type BX Cable, etc...) shall not be used.
7. Non-Metallic Conduit:
  - a. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only with solvent welded joints, conforming to Underwriters Laboratories, Inc. (U.L.) requirements, listed for exposed and direct burial application.
  - b. Conduit and fittings shall be produced by the same manufacturer.

N. Fittings:

1. Condulet type fittings shall be smooth inside and out, taper threaded with integral insulating bushing and of the shapes, sizes and types required to facilitate installation or removal of wires and cables from the conduit and tubing system. These fitting shall be of metal, smooth inside and out, thoroughly galvanized, and sherardized cadmium plated.
2. Metallic condulet covers shall have the same finish as the fitting and shall be provided for the opening of each fitting where conductors do not pass through the cover.
3. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.
4. U.O.N. all EMT fittings, connectors and couplings installed in concealed locations, areas not considered to be wet or damp locations by the AHJ, or areas not subject to physical damage, shall be steel, zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. Where suitable for use, steel set screw fittings are allowed for trades sizes of 2" and smaller. Insulated throat is not required for fittings, connectors and couplings 1" and smaller.
5. All interior and exterior EMT fittings, connectors and couplings, 2" and smaller, installed in exposed or concealed locations that are considered by the AHJ to be wet or damp locations, shall be raintite-listed, steel zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. If raintite-listed, steel, zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. If raintite-listed, EMT fittings, connectors and couplings are unavailable for a

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given trade size or if conduit is installed in an area subject to damage – provide rigid metallic or intermediate metallic conduits, fittings, connectors and couplings as required.

6. Flexible steel conduit connectors shall be or malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.
7. Conduit unions shall be "Erickson" couplings, or approved equal. The use of running threads will not be permitted.

O. 600 Volt Conductors - Wire and Cable:

1. All conductors shall be copper. Provide stranded conductor for #10 AWG and larger or when making flexible connections to vibrating machinery. Use compression "fork" type connectors or transition to solid conductors when connecting to switches, receptacles, etc.
2. Type THHN/THWN-2 thermoplastic, 600 volt, UL approved, dry and wet locations rated at 90 degrees Celsius, for conductors of all sizes from #12 AWG up to and including 1000 kcmil. RHH/RHW insulation is allowed only to provide an Electrical Circuit Protective System to comply with NEC, or CEC where adopted, Articles 695 and 700.
3. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.
4. Wire and cable shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. Each system shall be color-coded and it shall be maintained throughout.
5. Systems Conductor Color Coding:
  - a. Power 208/120V, 3PH, 4W:

|     |            |   |  |
|-----|------------|---|--|
| (1) | Phase A    | = | Black  |
| (2) | Phase B    | = | Red  |
| (3) | Phase C    | = | Blue   |
| (4) | Neutral    | = | White  |
| (5) | Switchlegs | = | Purple (Switchlegs shall also be identified separately by numerical tags). |
| (6) | Travelers  | = | Purple with Black stripe.  |
  - b. Power 480/277V, 3PH, 4W:

|     |             |   |  |
|-----|-------------|---|--|
| (1) | Phase A     | = | Brown  |
| (2) | Phase B     | = | Orange   |
| (3) | Phase C     | = | Yellow   |
| (4) | Neutral     | = | Grey   |
| (5) | Switch legs | = | Purple (Switchlegs shall also be identified separately by numerical tags). |
| (6) | Travelers   | = | Purple with black stripe.  |

- c. Ground Conductors: Green
  - d. Isolated Ground Conductors: Green with continuous yellow stripe.
  - e. Fire Alarm System: As recommended by the manufacturer.
6. All color-coding for #12 thru #6 AWG conductor shall be as identified above. Conductors #4 AWG and larger shall be identified with utilizing phase tape at each termination.
  7. No conductors carrying 120 volt or more shall be smaller than #12 AWG.
  8. Aluminum conductors shall not be used.
  9. Wire-pulling compounds used as lubricants in installing conductors in raceways shall only be "Polywater J". No oil, grease, graphite, or similar substances may be used. Pulling of No. 1/0 or larger conductors shall be done with an approved cable pull machine. Other methods; e.g. using vehicles and block and tackle to install conductors are not acceptable.

P. Junction and Pullboxes:

1. For interior dry locations, boxes shall be galvanized one-piece drawn steel, knockout type, with removable, machine screw secured covers.
2. For outside, damp or surface locations, boxes shall be heavy cast aluminum or cast iron with removable, gasketed, non-ferrous machine screw secured covers.
3. All boxes shall be sized for the number and sizes of conductors and conduits entering the box and equipped with plaster rings where required.

Q. Concrete Pull Boxes and Manholes:

1. Each concrete pre-cast section shall be identified by having the manufacturer's name and address cast into an interior face or permanently attached thereto. Associated Concrete Products-Quickset, Brooks Products or equal.
2. Structure Construction:
  - a. The pre-cast steel reinforced concrete structure walls, floor and roof shall safely sustain the loads and pressure resulting from vertical and lateral earth loadings and vehicular loadings.
  - b. Pre-cast structure shall be designed to withstand forces due to additional inward load of 4,000 lbs. (working load) with safety factor of 2, acting perpendicular to the surface at any pulling iron.
  - c. Structures shall be single piece or horizontal multi-section construction as required for field installation conditions. Multi-sections shall interlock with "Tongue and groove" joint mating surfaces to insure a rigid assembly.
  - d. All structure pre-cast joints shall be sealed with preformed cold field applied plastic joint sealing compound. Joint sealing compound shall not leak, sag or flow at the joints with 10 psi water pressure

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applied for 24 hours. Chemically resistant to acid, alkalies and saturated hydrogen sulfide.

- e. Each pre-cast structure section shall have suitable knockouts or openings in the vertical walls for the duct banks and conduits entering the structure. Provide a 1" diameter knockout in each corner of the floor slab, 6" from adjacent walls, for installation of ground rods.
- f. Pullboxes shall have deep recess conduit knockout concrete extensions at two opposite end walls. Additional shallow recess knockouts shall be provided on the other two walls for conduit entrances.
- g. Pullboxes shall be provided on precast concrete 6" extension grade ring "tongue and groove" mating surfaces to insure rigid assembly.
- h. Pullbox sizes shall be as indicated on drawings but in no case less than required by applicable codes. Minimum depth of the pullbox shall not be less than 42".
- i. The pullbox floor sump shall extend through the concrete floor into the gravel bedding, below the pullbox.
- j. Cover and frame assemblies:
  - 1) Traffic rated cover shall be hot dip galvanized steel flush fitting with threaded flush, slotted head, and stainless steel studs.
  - 2) Top ring frame shall be hot dip galvanized steel angle frame where the pullbox is installed in paving or concrete work. Assembly shall be rated for H-20 bridge loading.
  - 3) Top ring frame shall be armor bank type where the pull box is installed in exposed earth or landscaping. Assembly shall be rated for H-10 loading.
  - 4) Covers for 2'-0" x 3'-0" pullboxes shall be a single plate assembly Quikset TE-1000 series or equivalent.
  - 5) Covers for pullboxes larger than 2'-0" x 3'-0" shall be a double leaf, torsion spring-assisted hinged assembly. Quikset TL-400 Series or equivalent.
  - 6) Covers shall be permanently marked in the cover metal as follows:
    - a) "E" or "Electric" for covers on structures containing power circuits under 600 volts and "HV" or "high voltage" for covers on structures containing power circuits over 600 volts.
    - b) "Signal" for covers containing signal circuits.
- k. Furnish complete with galvanized pull irons, cable racks, hooks and porcelain insulator cable cradles.
- l. Provide a drainage sump, 6" diameter minimum, with a cast iron grate over the sump. Extend to gravel bedding below.

### 3. Manholes:

- a. The pre-cast concrete roof of each manhole shall be provided with a 36" minimum diameter opening, and shall be equipped with necking ring suitable for installation of cover assembly. Provide pre-cast concrete manhole grade ring(s) to bring the top of the cover to the required elevation. Concrete grade ring(s) shall be of sufficient height to provide 24" minimum finish earth cover over the

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top of the manhole roof. Rings shall be tongue and groove mating surfaces to insure rigid assembly.

- b. A pre-cast concrete grade ring cone shall set on top of the grade ring(s) to support the cast iron cover ring.
- c. Ladders shall be hot dip galvanized steel; length as required for manhole depth. Cast iron ladders' swing joint retaining hook and grade ring steps shall be provided in the manhole necking grade rings. Provide a ladder for each manhole.
- d. Manhole sizes shall be as indicated on drawings. Dimensions are inside clear, but in no case shall the manhole inside height floor to ceiling be less than 7'-0" and minimum length and width shall not be less than 6'-0" x 8'-0".
- e. 30" diameter clear opening, flush fitting in cover frame ring.
- f. Cover frame ring shall be cast iron and attach to the pre-cast concrete grade ring cone with ½" diameter inserts and adjustable slotted head, threaded stainless steel studs, minimum of four.
- g. Provide two lifting "Eye" holes in cover.

R. Outlet Boxes:

- 1. For fixtures, boxes shall be galvanized, one-piece drawn steel, knockout type equipped with 3/8" fixture studs and plaster rings where required.
- 2. For convenience outlets, wall switches, or other devices, outlet boxes shall be galvanized one-piece drawn steel, knockout type 4" x 4"x 1-1/2" minimum size with plaster rings as required.
- 3. For locations where standard boxes are not suitable due to number and size of conduit to be terminated, special boxes shall be designed to fit space or meet other requirements and submitted for approval.
- 4. For exposure to weather, damp locations, or surface mounting, outlet boxes shall be heavy cast aluminum or cast iron with threaded hubs; covers shall be watertight with gaskets and non-ferrous screws.
- 5. See drawings for floor box installation notes and specifications.

- S. Plywood Backboards: Where indicated for telephone or communications system terminals or other equipment assemblies, provide backboards of size indicated. Use 3/4" thick x 8' tall (length per plans), Douglas Fir, A/C grade, void-free, kiln-dried, fire-rated plywood finished on one side and prime coat painted on all surfaces with finish coat of white enamel paint. Leave one (1) fire-rating stamp on each sheet exposed for inspection.

T. Terminal Cabinets:

- 1. Terminal cabinets shall be fabricated of hot dipped galvanized code gauge sheet metal for flush or surface mounting, complete with barriered sections, a door for each vertically barriered section and sizes as indicated on plan. Doors shall be hinged and lockable. Locks shall be keyed to match the branch circuit panelboards. Terminal cabinet trims shall match the branch circuit panels.

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2. Provide each terminal cabinet with a full size plywood backboard.
  3. Terminal cabinets shall be installed complete with full-length skirts of the same construction and finish as the terminal cabinet.
  4. Where mounted outdoors, terminal cabinets shall be NEMA 3R, weatherproof complete with gaskets and required sealant to prevent moisture from entering the terminal cabinet.
  5. All terminal cabinets and terminal cabinet barrier sections shall be labeled by the cabinet or cabinet section use (i.e. CATV, Security, etc). Labels shall be Micarta type as specified elsewhere in these specifications. Unless otherwise noted, all termination blocks and cables shall be labeled per ANSI/EIA 607 standard.
- U. Painting: Terminal cabinets, panels, junction boxes, pull boxes, etc., and conduit installed in public view shall be painted with colors selected by the Architect to match the subject surface. Refer to painting section of the specifications for additional requirements.
- V. Seismic Design and Anchoring of Electrical Equipment:
1. Seismic Protection Criteria: All Electrical and Mechanical machinery installations provided, as part of this contract located in any Seismic Risk Zone of the Uniform Building Code Seismic Risk Map shall be protected from earthquakes in accordance with the Uniform Building Code and, as applicable, the state and local building codes and regulations. Protection criteria for these zones shall be a Horizontal Force Factor as prescribed by the UBC multiplied by the machinery weight considered passing through the machinery center of gravity in any horizontal direction. Unless vibration isolation is required to protect machinery against unacceptable structure transmitted noise and/or vibration, machinery shall be protected from earthquakes by rigid structurally sound attachment to the load supporting structure. The force factor and anchorage shall be determined by calculations performed and submitted to the Architect by a registered California professional engineer (civil or structural) hired by the contractor. The Contractor shall be responsible for the design of seismic restraint systems for all pieces of equipment weighing over 50 pounds including but not limited to the following:
    - a. Switchgear
    - b. Conduits/Conduit support trapezes
    - c. Transformers
    - d. Panels
    - e. Light Fixtures
    - f. UPS, PDU and Generator Equipment
    - g. Cable Tray / Flexible Cable Tray/ Ladder Tray
    - h. Bus Duct
  2. Seismic protection, labor, materials and design shall be included in the Contract sum.

W. Trenching and Backfilling: Contractor shall be responsible for trenching and backfilling. Refer to Trenching and Backfilling section of the specifications for complete requirements.

X. Relays, Contactors, and Timeswitches

1. Individual Control Relays (HVAC/Plumbing Control Functions)

a. Individual control relays shall have convertible contacts rated a minimum of 10 amperes, 600 volts regardless of usage voltage. Coil voltage, number and type of contacts shall be verified and supplied to suit the specific usage as shown in the wiring diagrams and/or schedules on the electrical, mechanical and plumbing specifications and drawings. Coil control circuit shall be independently fused, sized to protect coil. Relays shall be installed on prefabricated mounting strips. Each relay shall have a surge suppressor to limit coil transient voltages. Furnished in the NEMA Type 1 enclosure unless indicated otherwise.

b. The following relays are approved:

| Manufacturer     | Type               |
|------------------|--------------------|
| Cutler Hammer    | M-600              |
| General Electric | CR120BP            |
| Square D Co.     | Class 8501, Type X |
| Allen Bradley    | 700N               |

2. Contactors and/or Relays

a. Contactors and/or relays for control of lighting and/or feeders and/or panels shall be 600 volt AC, electrically operated, mechanically held units, open type for panel mounting with number of poles and of size as indicated on the drawings. Provide auxiliary control relay for operation of each contactor and/or relay with a two-wire and/or three wire control circuit as described on the plans.

b. Contactors and/or relays shall be mounted in panelboards in barriered section under separate hinged lockable doors or in contactor and/or relay cabinets as called for on the drawings. Contactors and/or relays shall be installed on Lord sound absorbing rubber mounts.

c. Contactors and/or relays shall be Automatic Switch Co. (ASCO) Bulletin #920 Series for 2 and 3 pole, and Automatic Switch Co. Bulletin 917 Series for contactors and/or relays containing 4 or more poles. Coil control circuit shall be independently fused, sized to protect coil.

d. Contactors and/or relays shall be equipped with a switch, in the proper configuration, to disconnect the control circuit controlling the coil of the respective device. Control circuit disconnect switch shall be labeled showing function of device.

3. Timeswitches

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- a. All timeswitches shall be Intermatic #ET70215C.
  - b. All timeswitches shall be mounted in separate section in top of panelboards or in separate enclosure unless otherwise indicated on drawings. Clear opening for timeswitch shall be a minimum of 12" x 12".
  - c. System shall include lighting contactors as indicated complete with auxiliary control relays so as to be compatible, with the output of the time controller.
4. Photocell with rating of 2000 watts, 16.6 amps, 120V, 60Hz AC. Suitable for -30° Fahrenheit to 158° Fahrenheit and weatherproof. Load to remain "ON" in case of cell failure and a time delay of 15 seconds Tork 2001/2002 Series or Paragon CW201 Series or equivalent unless herein specified otherwise, photocell to face north.
5. Contactors and/or Relays/Timeswitch Cabinet:
- a. Each contactor, relay, and/or timeswitches not indicated to be mounted in electrical panels shall be mounted in a cabinet, size as required, with hinged lockable door keyed same as panelboards. Construction of cabinet shall be similar to terminal cabinets.
  - b. Contactor cabinets shall be of the same manufacturer as the panelboards.
  - c. Where relays and/or contactors occupy the same enclosure as timeswitches they shall have a clear acrylic shield installed over each relay or contactor to guard live exposed parts from accidental contact by non-authorized personnel.
6. Control Power Transformer – Provide low voltage, 60HZ control power transformers, VA as required for HVAC controls.

Y. Manual Motor Starters

- 1. Provide flush or surface mounting manual motor starters with number of poles and size of thermal overload heaters as required for the motor being controlled (equipped with overload heaters, one for each motor lead). Back boxes shall be supplied with all flush mounting starters whether they are toggle type requiring only a 4" square outlet box or the larger type requiring a special box and cover designed to accept the particular unit.
- 2. Unless otherwise noted non the drawings, all manual starters for single phase motors, smaller than 1 hp, shall be the compact toggle type. Manual starters for all single phase motors, 1 to 5 hp, and all three phase motors up to 5 hp. Shall be the heavy duty type.
- 3. Where manual motor starter is shown with pilot light, the pilot light shall be installed in a separate outlet box adjacent to the starter outlet, and engraved nameplate to indicate function of pilot light.
- 4. Motor starters as manufactured by the following:

Single Phase

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26 10 00-24

| Manufacturer     | 1 hp and Below          | Others        |
|------------------|-------------------------|---------------|
| Arrow Hart       | Type RL                 | Type LL       |
| General Electric | CR 101                  | Class CR 1062 |
| I.T.E.           | Class C10, C11, C12     | Class C20     |
| Square D Co.     | Class 2510, Class 2510, |               |
| Type A           | Type B & C              |               |
| Allen Bradley    | Equivalent              | Equivalent    |

Z. Duct Sealant

1. Dottie LHD Series or equivalent.

AA. Firestop Sealant

1. 3M company fire seal / fire barrier / firestop system Hilti Inc., Wiremold or equivalent. System shall be UL listed for type of structure penetrated, element penetrating structure and maintain the fire rating of the structure penetrated. System shall be approved by the authorities having jurisdiction.

BB. Apparatus Supports

1. Swing connectors for steel rods supporting hanging electrical equipment (transformers, junction boxes, etc.) shall be equal to Steel City E-165, E-170, and E-232.

CC. Conduit Supports on Roofs

1. Supports for conduits routing exposed across roofs of buildings and covered walkways shall be Erico Caddy #PP Series Pipe Pier Supports or equivalent.

DD. Concrete Work

1. Portland Cement:
  - a. ASTM C33-67, Type II, Low Alkali Cement. Composed of Portland cement, coarse aggregate, fine aggregate, and water.
    - 1) Prepare concrete for use as electrical equipment footings, lighting pole bases and equipment slabs on grade, in accordance with pertinent sections of Specification Section 03300.
    - 2) Concrete for duct/conduit encasement, shall be 2.00 sacks of concrete per cubic yard of 3/8" pea gravel slurry. Provide a minimum of ten (10) pounds of red oxide concrete coloring powder per cubic yard of concrete.
    - 3) Mix shall obtain a 6" slump, measured with standard slump cone per ASTM C145-58.
  - b. Coarse Aggregate: Uniformly graded between maximum size not over 1-1/2" and not less than 3/4" and minimum size #4, crushed rock or washed gravel. For concrete encased ducts only, maximum aggregate size shall be 1/2".

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- c. Fine Aggregate: Clean, natural washed sand of hard and durable particles varying from fine to particles passing 3/8" screen, of which at least 12% shall pass 50 mesh screen.
- 2. Water: Clean and free from deleterious quantities of acids, alkalis, salts, or organic materials.
- 3. Reinforcement:
  - a. All reinforcing steel shall be placed in conformance with Title 24, Part 2, Chapter 26, Section 2607; U.B.C. Chapter 27, Section 2607, and Building Code requirement for reinforced concrete (ACI 318-89).
  - b. Reinforcing bars shall conform to Title 24, Part 2, Chapter 26, Section 2603(f) and requirements of A.S.T.M. A-615 grade 60, or ASTM A-706 grade 60 for bars requiring welds, except #3 and #4 bars may be grade 40.
  - c. All reinforcing bar bends shall be made cold.
  - d. Welded wire fabric shall conform at A.S.T.M. A-185.
- 4. Form Material: For exposed work, use PS 1-66 "B-B Concrete Form" plywood forms, or equal. Elsewhere, forms may be plywood, metal, or 1" x 6" boards. Forms for round lighting pole bases shall be sono-tube. Provide sandblast finish to eliminate sono-tube swirl lines in concrete.

## PART 3 - EXECUTION

### 3.01 PREPARATION AND INSTALLATION

#### A. Installation of Conduit and Outlet Boxes:

- 1. All conduit installed in the dry walls or ceilings of a building shall be steel tube (EMT), aluminum tube (EMT), or Intermediate Metal Conduit (IMC). Flexible conduit shall not be used in lieu of EMT, IMC or rigid conduit except as noted herein.
- 2. Galvanized rigid conduit (GRC) or intermediate metal conduit (IMC) shall be used as follows:
  - when noted on the drawings.
  - when considered exposed to damage by the local AHJ.
  - when installed in wet or damp locations and of a trade size where listed-raintite fittings, connectors, couplings etc. are unavailable.
  - when required by NEC or CEC Article 517.13.
  - when installed in concrete and masonry. The use of ENT in CMU walls and parking structures may be allowed only as directed in writing by the Engineer. Request for ENT substitution must be made prior to bid and in accordance

with pre-bid substitution requests requirements of these specifications.

3. Intermediate metal conduit (IMC), is approved for use in all locations as approved for GRC or EMT and in accordance with NEC, or CEC where adopted, Article 342.
4. Flexible steel conduit shall only be permitted to be used at light fixture outlets and connections to vibrating electrical equipment. All flexible steel conduit runs shall be less than 6'-0". All outdoor installation shall be made using liquid-tight flex with approved fittings. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of flexible conduit shall be allowed only as approved in writing by the Engineer.
5. Flexible liquidtight conduit shall be installed in lieu of the flexible steel; where required by the NEC, or CEC where adopted, in damp and wet location, where exposed to weather, in refrigerated area (65°F or less), and/or between seismic joints. All rotating electrical equipment shall be supplied with flexible, liquid-tight conduit with appropriate slack and shall not exceed thirty-six (36) inches. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of liquidtight flexible conduit shall be allowed as approved in writing by the Engineer on a case by case basis.
6. Rigid metallic conduit installed underground or embedded in concrete shall be 1" trade size minimum and shall be wrapped with 20 mil. Polyvinyl chloride plastic tape, PVC conduit installed underground or embedded in concrete shall be 3/4 " minimum trade size.
7. Conduit shall be run so as not to interfere with other piping fixtures or equipment.
8. The ends of all conduit shall be cut square, carefully reamed out to full size and shall be shouldered in fitting.
9. No running threads will be permitted in locations exposed to the weather, in concrete or underground. Special union fittings shall be used in these locations.
10. Where conduit is underground, under slabs or grade, exposed to the weather, or in wet locations, make joints liquid tight and gas tight.
11. All metal conduit in masonry and concrete and where concealed under floor slabs shall have joints painted with thread compound prior to makeup.
12. PVC conduit shall not be run in walls.
13. Where conductors enter a raceway or a raceway in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a plastic bushing type fitting providing a smoothly rounded insulating surface.

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14. Where conduit extends through roof to equipment on roof area, this Contractor shall provide flashing material compatible with the roofing system as required by the roofing specifications or as required by the Owner's roof warranty. This flashing shall be delivered to the roofing contractor for installation. The actual location of all such roof penetrations and outlets shall be verified by the Architect/Owner. Contractor to verify type of flashing prior to bid and include all costs.
15. All conduit shall be supported at intervals not less than 6'-0" and within 12" from any outlet and at each side of bends and elbows. Conduit supports shall be galvanized, heavy stamped, two-hole conduit clamp properly secured.
16. Where conduit racks are used the rack shall consist of two piece conduit clamps attached to galvanized steel slotted channels, properly secured via threaded rods attached directly to the building structure.
17. Nail-in conduit supports will not be allowed. One-piece setscrew type conduit clamps or perforated iron for supporting conduit will not be permitted.

18. Seismic Conduit Support:

- a. All conduit shall be supported in such a manner that it is securely attached to the structure of the building. Attachment is to be capable of supporting the tributary weight of conduit and contents in any direction. Maximum spacing of support and braces are to be as follows:

CONDUIT SIZE    MAXIMUM SPACING

|              |       |
|--------------|-------|
| 1/2" to 3"   | 6'-0" |
| 3-1/2" to 4" | 8'-0" |

19. All conduit runs shall be installed parallel or perpendicular to walls, structural members, or intersection of vertical planes and ceilings. Field made bends and offset shall be avoided where possible. Crushed or deformed raceway shall not be installed.
20. Open knockouts in outlet boxes only where required for inserting conduit.
21. Locate wall outlet of the same type at same level in all rooms, except where otherwise noted.
22. Outlet boxes on metal studs shall be attached to metal hangers, tack welded or bolted to studs; on wood studs attachment shall be with wood screws, nails not acceptable.
23. Recessed boxes shall not be mounted back-to-back in any wall; minimum offset shall be 24 inches.
24. Junction Boxes that do not contain any device(s) shall be located in storage rooms, electrical closets, or above accessible ceilings, not in hard lid

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ceilings or other forms of inaccessible ceilings. Place boxes which must be exposed to public view in a location approved by the Owner's Project Manager. Provide covers or plates to match adjacent surfaces as approved by the Owner's Project manager.

25. Surface mounted panels secured to stud walls shall be secured to wall using 1/2" x 3" screws into steel backing plate as detailed by the Architect.
26. Sleeves shall be installed where conduit passes through masonry or concrete walls and shall be 24 gauge galvanized steel no more than 1/2" greater in diameter than the outside diameter of the conduit. When located in non-rated structures, caulk conduit sleeve with stone wool and waterproof below grade. When located in fire rated structures, provide U.L. listed fire stopping system. See fire stopping section of this specification for additional requirements.
27. All boxes shall be covered with outlet box protector, Appleton SB-CK, or similar device / method to keep dirt / debris from entering box, conduit or panels. If dirt / debris does get in, it shall be removed prior to pulling wires.
28. All boxes installed outdoors shall be suitable for outdoor installations, gasketed, screw cover and painted as directed by the Architect with weatherproof paint to match building.
29. All conduit entries to outdoor mounted panels, cabinets, boxes, etc., shall be made using Myers "SCRU-TITE" hubs Series ST.
30. Provide nylon or a 1/8-inch O.D. polyethylene rope, rated at 250 pounds tensile strength, in all conduits more than 5 feet in length left empty for future use. Not less than 5 feet of rope shall be left at each end of the conduit. Tag all lines with a plastic tag at each end indicating the termination/stub location of the opposite end of the conduit.
31. All multiple conduit runs within suspended ceilings shall be suspended from building structure by means of unistrut hangers/racks, Conduit shall not be allowed to lay on ceiling or be supported from ceiling suspension wires or other suspension system. Support conduit to structure above suspended ceilings 8" minimum above ceiling to allow removal of ceiling tile. Maintain two-inch clearance above recessed light fixtures
32. All exposed conduits and support hardware shall be painted to match the finish of the wall or ceiling to which it is supported.
33. Where conduits or wireways cross seismic joints, provide approved flexible conduit connection or approved expansion/deflection fitting to allow for displacement of conduit in all three axes. Connection shall allow for movement in accordance with design of seismic joint. Non-flexible raceways crossing expansion joints or other areas of possible structural movement shall make provision for 3-way movement at such points by means of expansion/deflection fittings. Fittings shall be installed in the center of their axes of movement and shall not be deflected to make part of a conduit bend, or compressed or extended to compensate for incorrect conduit expansion/deflection fittings(s) complete with ground jumpers.

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34. Where necessary, provide approved expansion joints to allow for thermal expansion and contraction of conduit(s). Install expansion joints complete with ground jumpers.
35. Seal all conduits where termination is subject to moisture or where conduit penetrates exterior wall, floor or roof, in refrigerated areas, classified (hazardous areas) and as indicated on the drawings.
36. Except as otherwise indicated on the Drawings or elsewhere in these specifications, bends in feeder and branch circuit conduit 2 inches or larger shall have a radius or curvature of the inner edge, equal to not less than ten (10) times the internal diameter of the conduit. Except where sweeping vertically into a building where sweep radius equals 10x conduit diameter, underground communications and building interconnect conduits 3 inches or larger shall have a minimum 12'-6" radius or curvature of the inner edge. For the serving utilities, radius bends shall be made per their respective specifications.
37. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit, footage end-to-end, and the location of the other end. In wet, corrosive outdoor or underground locations, use brass, bronze, or copper 16 gauge tags secured to conduit ends with #16 or larger galvanized wire. Inscribe on the tags, with steel punch dies, clear and complete identifying information.
38. The following additional requirements shall apply to underground conduits:
  - a. Underground conduit shall be Schedule 40 PVC (polyvinyl chloride) unless otherwise indicated elsewhere in these specifications or as required per NEC, or CEC where adopted Article 517.13.
  - b. For all communications conduits, 2" and larger, and where feeders are 100 amps or greater, provide with a minimum 3" inch, (2,000 LB) concrete envelope, 2" inch minimum separation between conduits, installed at depth of not less than 24" below grade. (Provide concrete encasement and/or greater minimum conduit depth as required by the Utility Companies.) Conduit separation within a duct bank shall be maintained using plastic spacers located at 5'-0" intervals. Where power and communication conduits are run in a common trench, a 12" inch minimum separation shall be maintained between power and communication conduits or as required by Utility Companies.
  - c. In all cases, where any conduit(s) pass under a building slab or footing, the electrical contractor will provide a Bentonite clay or concrete barrier that conforms to the height and width of the trench excavation and is a minimum of 18" thick. In all cases, where conduit(s) pass thru a sleeve in a footing or other foundation element, the electrical contractor will provide a Bentonite clay or concrete barrier between the sleeve and the conduit(s) surrounding the conduit(s) for the entire depth of the sleeve. The barrier is required to prevent passage of moisture under or thru the slab or

footing via the trench or sleeve. Provide caution tape 12" below finish grade on all conduits unprotected by concrete.

- d. Where underground conduit passes under a building slab, concrete encasement may not be required, except as required above, contact the Engineer for written direction prior to omitting any encasement.
- e. Underground conduits, which terminate inside building(s) below grade, such as in a basement level, or which slope so that water might flow into interior building spaces, shall be sealed at the point of penetration with a modular conduit seal (Link-Seal or equal by Rox Systems). Conduit/conduit sealing system penetrations of waterproofing membranes/systems on existing structures shall be completely restored as required to maintain membrane/system manufacturer and installer warrantee for the installation. All conduits shall be provided with a 4% slope away from buildings. All conduits shall be installed such that the water cannot accumulate in the conduit and such that water drains into the nearest manhole, pull box or vault – not into the facility. In instances where grade changes or elevation differences prevent sloping of conduit away from a building into the nearest manhole, pull box or vault or where accumulation of water in a manhole, pull box or vault may result in water traveling into the facility, conduits shall be sealed internally at each end of each conduit using conduit sealing bushing, sized as required for the conductors contained within the conduit (O-Z Gedney #CSBG 100psig withstand or equal). In all cases, install plugs or caps in spare (empty) conduits at both ends of each conduit (Jackmoon or equal) able to with seal both water and gas from entering the facility via the conduits.
- f. Include a separate insulated green ground conductor sized per NEC in each conduit.
- g. All underground conduits with circuits rated at 40 amps or greater and all underground communications conduits shall be provided with a metallic marker tape located 12 inches below the finished grade.
- h. Where underground conduits sweep into/thru slabs, utilize PVC 90 degree sweeps that transition, via female PVC adapter to GRC coupling mounted flush in slab. GRC couplings shall be 1/2 lap taped with 20-mil tape. If the distance of the conduit run between a sweep and the next connecting sweep, pullbox, vault or manhole exceeds 150 ft then the sweep shall be concrete encased. Exceptions:
  - 1) Communications conduits shown terminating at a finished floor shall have an additional 4" high GRC nipple equipped with a bushing, removable conduit plug, labeling tag and pull rope. Tie off pull rope to conduit plug.
  - 2) Utility conduit sweeps shall be installed per the requirements of the respective utility company.

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- i. All PVC conduit shall be glued for a water and gas tight installation. The contractor shall use appropriate solvent on all joints prior to gluing conduit together.

B. Installation of 600-Volt Conductors:

1. All electrical wire, including signal circuits, shall be installed in conduit.
2. All circuits and feeder wires for all systems shall be continuous from over current protective device or switch to terminal or farthest outlet. No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.
  - a. Utilize preinsulated "winged" spring type connectors, 3M Company "Performance Plus" #O/B or #R/Y as required for splices and taps in conductors No. 6 AWG and smaller. When a spring connector is used in an underground environment or when subject to moisture, utilize a 3M Company Scotchcast 3507G epoxy resin connector sealing pack to seal the spring connector.
  - b. Wires No 4 AWG and larger AWG shall be joined together as follows:
    - 1) When located in an underground environment or when subject to moisture, the splice shall be made with compression connector and sealed by a 3M, or equal, PST cold shrink connector insulator.
    - 2) When located in an interior environment, the splice shall be made with an IlSCO or equal dual rated, insulated splice-reducer connector or multi-tap connector-listed for use with 75/90 degree Celsius rated conductors.
  - c. Connections to busbar shall be made with dual-rated copper/aluminum one-piece compression lugs. Paralleled conductor connections shall be by mechanical lugs.
3. Thoroughly clean all conduit and wire-ways and see that all parts are perfectly dry before pulling any wires.
4. Install UL approved fixture wire from all lighting fixture lamp sockets into fixture outlet or junction box.
5. For 20 ampere branch circuit wiring, increase No. 12 conductors to No. 10 for 120 volt circuits longer than 100 feet and for 277 volt circuits longer than 150 feet.
6. Conductor Support. Provide conductor supports as required by codes and recommended by cable manufacturer. Where required, provide cable supports in vertical conduits and provide lower end of conduit with a ventilator.

C. Occupancy Sensors:

1. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage and shall accommodate all habits of single or multiple occupants at any location within the room. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms that are to be provided with sensors. The contractor shall provide additional sensors as required to properly and completely cover the respective room. Additionally, it may be necessary for the contractor to make adjustments, change the location or type of sensor to obtain proper operation in a specific room. The contractor shall have final responsibility for proper operation of the system in each room and should therefore make labor allowances for changes and adjustments.
2. Where wall switches are indicated in combination with occupant sensors, switches shall be connected to the load side of occupant sensors, this will permit the sensor to operate and enable the occupants to turn off the lights in the room. Where noted, provide bi-level switching and connect as shown on the drawings.
3. Ceiling mounted sensors should be located in the space to be covered, a minimum of 4', preferable 5' away from the latch side of the door, 2" to 3" away from the wall and 3' to 4' from an air supply register, do not mount sensors over a doorway or behind a full height door. Sensors shall be aimed in the direction of the space to be covered. Do not aim sensors toward a doorway.
4. Unless otherwise noted on the drawings, all sensors shall be adjusted for a time delay of ten minutes.
5. It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.
6. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, maintenance, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.
7. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free installation.
8. As part of the "record drawings" indicate on the reflected ceiling plan the exact location (ceiling tile or access panel) of each power pack and slave unit.

D. Grounding / Bonding:

1. Provide grounding and bonding for entire electric installation as shown on  
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plans, as listed herein and as required by applicable codes. Included, but not limited to, are items that require grounding / bonding:

- a. Conduit, Raceways and Cable Trays.
  - b. Neutral or identified conductors of interior wiring system.
  - c. Panelboards and Switchboards.
  - d. Non-current carrying metal parts of fixed equipment.
  - e. Telephone distribution equipment.
  - f. UPS, PDU, ATS and Generator Systems
  - g. Raised Flooring
  - h. Antennas
  - i. Lightning Protection Systems
2. Use of Ground Rods: Furnish and install required number of 3/4" x 10' copper clad ground rods to meet specified resistance, all required grounding wires, conduit and clamps. The size of the grounding conductors shall be not less than that set forth in the latest edition of the California Code of Regulations, Title 24, State of California and NEC (CEC, where adopted), unless otherwise indicated. Rods shall be installed such that at least 10 feet of length is in contact with the soil. Where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from vertical or shall be buried in a trench that is at least 30 inches deep. The upper end of the electrode shall be flush with or below ground level unless the aboveground end and the grounding electrode conductor attachments are protected against physical damage. Unless otherwise noted, connection to the grounding electrode conductor may be by compression type or exothermic process connector. Mechanical connectors shall not be used.
3. Grounding System Connection:
  - a. Compression connectors shall be unplated copper, manufactured by Burndy, or approved equal, designed specifically for the intended connection.
  - b. Exothermic weld-type connectors shall be 'Cadweld' manufactured by Erico Products, or approved equal, designed specifically for the intended connection.
  - c. Mechanical connectors shall not be used.
4. Isolated Ground Receptacles shall have an insulated ground wire connected between the receptacle and the panelboard isolated ground bus. Unless otherwise noted, this ground wire shall not be grounded at any other point, and shall be distinguished from other ground wires by a continuous yellow stripe.
5. Provide separate green equipment ground conductor in all electrical raceways, to effectively ground all fixtures, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, busses, etc., for this purpose. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through No. 10 AWG. Use NEC (or CEC where

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adopted) Table 250-122 for conductor size with phase conductors No. 8 and larger, if not shown on the Drawings.

6. Clean the contact surfaces of all ground connections prior to making connections.
7. Ductwork. Provide a flexible ground strap, No. 6 AWG equivalent, at each flexible duct connection at each air handler, exhaust fan, and supply fan, and install to preclude vibration.
8. Motors. Connect the ground conductor to the conduit with an approved grounding bushing, and to the metal frame with a bolted solderless lug. Bolts, screws and washers shall be bronze or cadmium plated steel.
9. Building grounding system resistance to ground shall not exceed 25 ohms.

E. Line Voltage and Low Voltage Power Supplies to all Mechanical Equipment Including Plumbing, Heating and Air Conditioning Units;

1. An electric power supply, including conduit, any necessary junction and/or outlet boxes and conductors and connection shall be furnished and installed by this Contractor for each item or mechanical equipment.
2. Power supplies to individual items of equipment shall be terminated in a suitable outlet or junction box adjacent to the respective item of equipment, or a junction box provided by the manufacturer or the equipment and directed by the Mechanical Contractor. Allow sufficient lengths of conductor at each location to permit connection to the individual equipment without breaking the wire run.
3. The location of all conduit terminations to the equipment is approximate. The exact location of these conduit terminations shall be located and installed as directed by the Mechanical and Plumbing Contractor.
4. Provide power supplies to all plumbing and mechanical equipment, including but not limited to, equipment furnished and installed by Owner or Contractor such as heating and air conditioning equipment, pumps, boilers, auto valves, water coolers, trap primers etc. The installation shall produce a complete and operable system.
5. Unless otherwise noted, this Contractor shall furnish and install all conduit, boxes, wires, etc., for line voltage wiring and low voltage wiring.
6. It is the Contractor's responsibility to verify with the Drawings of other trades regarding the extent of his responsibility for mechanical equipment. The bid must include a sum sufficient to cover the cost of the installation.
7. The location of all power supply connection and/or terminations to the mechanical equipment is approximate. The exact locations of these terminations shall be verified with other trades during construction.

F. Prefabricated Equipment: Installation of all prefabricated items and equipment shall conform to the requirements of the manufacturer's specifications and

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installation instruction pamphlets. Where code requirements affect installation of materials and equipment, the more stringent requirements, code or manufacturer's instructions and/or specifications, shall govern the work.

G. Firestopping:

1. It is the intent of the contract documents, which are presented in "design-build" format for the contractor to design, provide and install a complete and fully functioning, code approved, UL listed fire stop assembly/system(s).
2. The contractor shall be responsible for furnishing all final design, agency approvals, labor, equipment, materials, and performance of operations in connection with the installation of a complete and fully functioning code approved fire stop assembly/system(s).
3. It shall be the contractor's responsibility to provide all material and equipment, which is usually furnished with such systems, in order to provide a complete and fully functioning code approved firestop assembly/system(s) whether mentioned herein or not.
4. Each fire stop assembly/system shall have an "F" and/or "T" rating as required by each penetration condition. Each Firestop assembly/system shall have a current U.L. listing, as indicated in the latest edition of the U.L. Fire Resistance Directory, and be approved for use by the authority having jurisdiction. The contractor shall install each firestop assembly/system in accordance with the manufacturer's printed instructions.
5. Each fire stop assembly/system shall be labeled with fire stop manufacturer-furnished label on each side of the fire stopping systems depicting UL number etc.

H. Housekeeping Pads

1. Provide a minimum 3" high housekeeping pad above finished floor/finished grade for all exterior floor mounted switchgear, distribution boards, transformers, motor control centers etc flush with the face of the equipment. Provide a minimum 3" high housekeeping pad for all floor mounted switchgear, distribution boards, transformers, motor control centers, transfer switches etc located in mechanical central plant(s) and other mechanical spaces flush with the face of the equipment. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions regarding housekeeping pads are met.
2. Unless otherwise noted above, provide a minimum 1-1/2" high housekeeping pad above finished floor/finished grade for all interior floor mounted switchgear, distribution boards, transformers, motor control centers, transfer switches etc flush with the face of the equipment. All housekeeping pad heights are as measured from finished floor or grade. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions regarding housekeeping pads are met.

3. Provide a 1-1/2" high housekeeping pad above finished floor/finished for service equipment. Prior to pad rough-in, contractor shall verify serving utility company's maximum meter height requirements and, if necessary, adjust height of housekeeping pad to comply with those requirements. In indoor applications, the pad shall be flush the face of the switchgear. In outdoor applications, the housekeeping pad shall extend a minimum of 4 feet from the front of switchgear's weatherproof enclosure. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions regarding housekeeping pads are met.
4. All housekeeping pads located in, on or attached to a building shall be seismically braced/connected to the building structure.

I. Concrete Pullboxes and Manholes

1. Excavate for installation of pre-cast structures remove excess excavated material from the site. Saw cut existing paving and concrete as required for excavation. Where multiple conduits enter sheet steel pull boxes, boxes shall be field punched. Do not use boxes with concentric knockouts.
2. Provide a minimum of 6" deep sand bedding base under each pull box and manhole. Bedding shall be level and well compacted by a minimum of four passes with a plate type mechanical vibrator.
3. Install a floor drain in every concrete pullbox into a sump containing 10 cubic feet of 1" crushed rock; minimum size 48" deep and 36" diameter. Provide 36" length of tile pipe extending down into the sump. Provide a grille over the top opening of pipe.
4. Back fill and compact each around pre-cast structure after installation of the structure to 95% minimum compaction in horizontal lifts of 8" thickness or as stated by compaction equipment. Replace paving, concrete, landscaping above structure to match existing.
5. Install pre-cast structures per manufacturers recommendations to provide a dry watertight installation. Set cover flush with existing grade or finish surface. Where pre-cast structure is installed in pedestrian walkway or vehicular traffic way with a sloping finish grade, slope cover to match existing.
6. Install structures to avoid surface water drainage flow lines, and existing utilities.
7. Entrances of conduits/ducts shall terminate with end bells inside the pre-cast structure.
8. Where pullboxes/manholes are shown to intercept existing conduit, remove portion of existing conduit approximately 4 ft. back from wall, re-grade and excavate conduit entrance and extend existing conduit into pullbox. Pot hole as required to locate conduit(s).
9. Provide 10' long x 3/4" diameter copper clad, steel, driven ground rods

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through the floor of the pre-cast structure. Ground rod shall extend 6" above the floor line. Where rock bottom is encountered, bury ground rod in horizontal trench with projection into pre-cast structure. Seal off openings around ground rod.

10. Ground permanently and effectively together all metal equipment cases, cable racks, etc., with #4 bare copper bonding conductor. Provide UL compression bonding fittings at each ground connection.
11. After cable have been pulled and inspected, seal box between cover and frame with a mastic compound similar to Parmagum or Dukseal.
12. Exterior concrete walls, tops and bases of pre-cast structure shall be damp-proofed with two coats of a bituminous damp-proofing material, minimum finish thickness 4-mil.
13. Connections to Pre-cast Structure.
  - a. Lines connecting to pre-cast structures shall be constructed to have a cast in place concrete tapered section adjacent to the structure and extending a minimum of 48" out from the structure to provide shear strength.
  - b. Pre-cast structure shall be constructed to provide for keying the concrete envelope of the conduit/duct line into the wall of the structure. Mechanical vibrators shall be used when this portion of the envelope is poured to assure a seal between the envelope and the wall of the pre-cast structure.
  - c. Provide end bells in duct entrances. Terminate each metal conduit with insulated bushing having grounding terminal, O.Z. Type "Big".
14. Place pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.
15. Identify all power and signal cables by tagging in all manholes and pull boxes. Tie securely to cables with nylon cord or insulated type TW wire. Tie so that turns of wires do not form a closed electrical circuit.
16. Manholes, vaults and pullboxes required by utility company, and installed by Electrical Contractor, shall meet all requirements of utility company.

J. Trenching, Footings, Sleeves

1. Provide trenching, concrete encasement of conduits, backfilling, and compaction for the underground electrical work, in accordance with applicable sections of this specification. Back fill and compact earth after installation of duct bank/apparatus to 95% minimum compaction in horizontal lifts of 8" thickness or as stated by compaction equipment. Replace paving, concrete, landscaping to match existing as applicable.
2. Provide footings for all post and/or pole mounted lighting fixtures: Concrete shall conform to the applicable sections of this specification.

3. Sleeves:

- a. Provide sleeves for raceways, conduit and pathway for future cabling passing through the following construction elements.
  - 1) Concrete foundations, floors, walls and slabs.
  - 2) Lath and plaster walls and ceilings.
  - 3) Building structures (i.e. foundations, walls, floors, ceilings, and roofs) with a fire rating exceeding 20 minutes.
  - 4) Full height interior walls.
- b. Provide sleeves through inaccessible ceiling areas to create a cabling path to the main signal/data room(s) to allow for the installation of future cabling.
- c. Sleeves shall be flush with walls and foundations. Sleeves shall be installed at exact penetration locations and angles to accommodate raceway and conduit routings.
- d. Joists, girders, beams, columns or reinforcing steel shall not be cut or weakened. Where construction necessitates the routing of conduit or raceways through structural members, framing or under footings, written permission to make such installation shall first be obtained from the Architect. Such permission will not be granted, however, if any other method of installation is possible.
- e. The layout and design of raceways and conduits located in or routed through masonry or reinforced beams or walls shall be reviewed by the Architect before any work is performed. All sleeving shall be accomplished according to the instructions of the Architect and shall be accepted before any concrete is poured.
- f. Sleeves, raceways and conduit shall be located to clear steel reinforcing bars in beams. Reinforcing bars in walls shall be offset to clear piping and sleeves.
- g. Provide ½" continuous clearance between inside of sleeve and exterior of conduits and raceways passing through the sleeve, unless otherwise specified. Where sleeves pass through outside walls below grade, provide full 1" clearance between exterior of conduits and raceways passing through the sleeve. For seismic joints, clearance shall be 3".
- h. Sleeves set in fire rated walls, or floors shall be sealed. Sleeving shall maintain the fire rating of the wall or floor. A UL listed fireseal / fire barrier / firestop system shall be installed in accordance with the manufacturer's requirements. Provide sleeves, wrapping, caulk and supports.
- i. Sleeve Material:
  - 1) In concrete walls and footings: Schedule 40 black steel pipe. When installed in outside walls, seal outer surface watertight.

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- 2) In lath and plaster partitions and ceilings: 24 gauge galvanized iron or steel.

K. Concrete Work

1. Concrete work shall be executed in accordance with all applicable codes and regulations of the California Code of Regulations, Title 24, Part 2, Chapter 26.
2. Form:
  - a. Space forms properly with spreaders and securely tie together. Do not use twisted wire form ties. Keep forms wet to prevent joints from opening up before concrete is placed. Replace improper construction as directed. Do not use wood inside forms.
  - b. Build in and set all anchors, dowels, bolts, sleeves, iron frames, expansion joints and other materials required for the Electrical Work. Place all items carefully, true, straight, plumb and even.
  - c. Carefully remove all exposed forms. Cut nails and tie wires below face of concrete and fill all holes. Rubbish will not be allowed to remain in, under, or around concrete.
3. Mixing: Use batch machine mixer of approved type. After ingredients are in mixer, mix for at least 1-1/2 minutes.
4. Transit mixing: In lieu of mixing at site, transit mixing may be used if rate of delivery, haul time, mixing time, and hopper capacity is such that concrete delivered will be placed in forms within 90 minutes from time of introduction of cement and water mixer.
5. Placing of Concrete:
  - a. Before placing concrete, remove wood, rubbish, vegetable matter and loose material from inside forms. Thoroughly wet down wood forms to close joints.
  - b. Clean reinforcement; remove paint, loose rust, scale and foreign material. Bars with bends not called for will be rejected. Hold securely in place to prevent displacement. Lap bar splices 30 diameters, min; lap fabric one mesh min. tie intersections, corners, splices with 16 ga. Annealed wire, or as otherwise called for.
  - c. Place concrete immediately after mixing. Do not use concrete that has begun to set; no tempering will be allowed. If chuting issued, avoid segregation. In placing new concrete against existing concrete, use bonding agent per manufacturer's directions.

- d. Give careful and thorough attention to curing of concrete. Keep concrete and forms wet for a minimum of 10 days, after placing concrete.

6. Concrete Finish:

- a. Finish of Exposed Concrete: Horizontal surfaces, steel troweled monolithic finish; vertical surfaces, smooth and free of fins, holes, projection, etc.
- b. Exposed lighting pole bases shall be finished to a smooth finish. Provide sandblast finish to create texture and eliminate swirl lines from forms.

L. Sound Control

- 1. Before the work will be accepted as complete, quietness of operation, to a degree satisfactory to the Architect, shall be attained for apparatus, equipment, fixtures, etc., included under the electrical work. Provide isolation and vibration protection required.
- 2. It is the objective of this specification to provide the necessary design for the avoidance of excessive noise or vibration in the building due to the operation of machinery or transformers, and/or due to interconnected conduit.
  - a. Furnish and install the vibration isolation devices as specified herein.
  - b. Do not install any equipment or conduit as specified in the schedule, which makes rigid contact with the "building" unless it is approved in this specification or by the Architect. "Building" includes slabs, beams, studs, walls, lath, etc.
  - c. Coordinate work with other trades to avoid rigid contact between equipment or conduit as specified in the schedule and the building. Inform other trades following his work, such as plastering, to avoid any contact, which would reduce the vibration isolation.
  - d. Bring to the Architect's attention, prior to installation, any conflicts with other trades which will result in unavoidable contact to the equipment or conduit as specified in the schedule, described herein due to adequate space, etc. Corrective work necessitated by conflicts after installation shall be at the Contractor's expense.
  - e. Obtain written and/or oral instructions from the vibration isolation manufacturer as to the proper installation and adjustment of vibration isolation devices.
  - g. Correct, at no additional cost, all installation, which are deemed to be defective workmanship or materials by the Architect.

general electrical requirements



3. Isolators shall be provided at transformers and electrical equipments where indicated on the drawings. Isolators shall be OSA approved and manufactured by California Dynamics Corporation RJEQ Series or Sausse RMLS Series or Mason Industries BR Captive Mounting Series.
4. Provide flexible conduit or an approved vibration isolation device between any transformer, and building structure and/or between any transformer and equipment mounted directly to building structure.
5. Electrical panels shall be connected to transformers by flexible conduit. Do not contact stud or masonry partitions. Isolate panels from the floor as specified herein.
6. Provide flexible conduit connections at all air conditioning, plumbing, etc., or any rotating or oscillating equipment requiring electrical motors. Base the length of flexible conduit required for each motor upon the requirements for a 360° loop in the conduit between the electrical motor and electrical box. (Do not actually twist the conduit into a loop).
7. As an alternative, a neoprene or rubber busing between the conduit and the electric motor to break the metal-to-metal contact may be used. Provide a flexible ground strap to complete the electrical ground.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The lighting fixtures, lamps, ballasts, power supplies, drivers and transformers for this project have been specified to ensure that specific aesthetic and performance requirements will be satisfied. These products have been carefully researched and each specified item has unique qualities which were determined to be essential in satisfying the owner's, architect's, engineer's and lighting consultant's design criteria, while still fitting within the established project budget. In addition, the manufacturing and shipping time requirements for each of the specified lighting fixtures have been verified to fit within the established construction schedule.
- B. Contractor shall provide all materials as detailed on drawings and/or schedules, and labor as required to achieve a complete and operating lighting system.
- C. Contractor shall perform all work in strict accordance with all local, national and seismic governing codes. Work not in conformance with applicable codes shall be brought into compliance at no additional cost to the owner.
- D. All electrical material shall be new and in perfect condition when installed. All equipment shall be listed, labeled or certified by a nationally recognized testing laboratory.
- E. All equipment shall be factory tested to ensure proper operation prior to shipment to job site.
- F. Contractor shall be responsible for all electrical permits and inspection fees. It is the responsibility of the contractor to schedule all electrical inspections required by the building department and serving utilities.
- G. Contractor shall guarantee all materials and workmanship related to the electrical installation for a minimum period of one year from the date which the owner accepts the finished project. Any defects in materials or workmanship during this guarantee period shall be corrected by the contractor at no additional cost to the owner or tenant.
- H. Contractor shall immediately notify lighting consultant of any required modifications that are not shown on the drawings.
- I. Electrical contractor shall be licensed by the jurisdiction where the project is located and capable of employing the proper labor force necessary to complete the installation.
- J. Delivery of equipment to the job site shall be in clearly identified crates, cartons, or appropriate shipping containers as to item, quantity, and installation location.
- K. Contractor shall notify lighting consultant of any provision of specification that is in conflict with local or national codes and an addendum shall be issued to correct the specification. Local or national codes will take precedence.

- L. All measurements found in lighting plans are approximate. Contractor is required to make field measurements based on actual site conditions to develop complete orders and install systems per drawings and specifications.
- M. Refer to architectural plans for exact location and elevation of all lighting fixtures and all devices. All wall-mounted lighting fixture and device heights shall be verified with the architect prior to rough-in.
- N. Emergency egress lighting shall be the responsibility of the electrical engineer in consultation with local or national codes.
- O. Contractor shall properly "ring out" and verify all circuitry, dimming and control prior to focus and programming phase commencing.
- P. Contractor services shall include necessary systems integration and engineering, project management and interface with owner, consultants, architects, contractors and all other parties necessary to provide a complete and working lighting system.
- Q. Contractor services shall include a systems integrator to properly coordinate the installation and setup of the specialty lighting fixtures and control equipment (e.g. Dmx, Ethernet, RS232, SMPTE, etc.) Specified by the lighting consultant, if applicable.

## 1.2 DEFINITIONS

- A. Luminaire (Light Fixture): a complete lighting device consisting of lamp(s) or led modules together with parts designed to distribute light, to position and protect lamps, to mount the lighting fixture as required and to connect lamps to power supply.
- B. LED: light emitting diode.

## 1.3 SUBMITTALS AND SUBSTITUTIONS

- A. Contractor to submit for approval on the products he/she intends to furnish within ten (10) days of award of contract. Failure to submit within deadline constitutes a guarantee that only the base specified products will be supplied and that no other products, whether listed as alternates or not, will be considered.
- B. Contractor to provide a submittal/shop drawing submittal for each lighting fixture type in order of lighting unit designation, including accessories, ballast(s), power supply(ies), LED driver(s) (if applicable) and/or transformer(s). Any lighting fixture submittal submitted without specific lighting fixture's accessories, ballast, power supply, driver and/or transformer information shall be rejected as incomplete. In addition, see general lamp schedule notes for separate lamp submittal requirements.
- C. Substitutions of the specified products are strictly prohibited - unless approved as stated herein. Lighting fixture, ballast or driver substitutions shall be formally presented to the Lighting Consultant, by appointment only, at least ten (10) working days prior to bid time. The submittal material shall include the following items.
  - 1. A complete and operating sample, wired for 120v operation, with lamp, cord and plug.

2. A complete photometric report, for the proposed substitute product, using the specified lamp type and wattage, including tabulated candlepower values, coefficient of utilization, and an iso-foot-candle diagram. Prorated data will not be acceptable. The photometric report must be done in accordance with published IESNA testing procedures and certified by a registered Electrical Engineer.
  3. A current original catalog data sheet with lighting fixture catalog numbers. Modified data sheets will not be acceptable.
  4. A signed copy of the "substitution compliance form", located in the Division 1 specification, stating that if the proposed substitution is accepted, the project schedule will not be negatively affected. If the completion of the project is delayed because of the approved substitution, the electrical contractor will be responsible for payment of any established liquidated damages.
  5. For specific interior lighting fixture substitutions, when directed by the Lighting Consultant, a point-by-point scaled computer printout shall be provided verifying the illumination levels for the specific interior area. If the substituted lighting fixture is an emergency lighting fixture, the report shall be run in both normal and emergency modes. This report shall be configured with specific constraints, as directed by the Engineer of Record. The report must show that the substituted lighting fixture provides performance equal to or better than the lighting levels of the specified product.
  6. For all exterior lighting fixture substitutions, a point-by-point scaled computer printout shall be provided verifying the illumination levels for the entire site plan based on using the proposed alternative lighting fixtures. The report must show that the substituted lighting fixture provides performance equal to, or better than the lighting levels and uniformity ratios (max:min and avg:min) of the specified product. This report shall be configured with the following constraints.
    - a. The spacing increment or points on the verification report shall not exceed ten (10) feet in either direction.
    - b. The printout shall be based on providing maintained foot-candle levels using mean lamp lumens and a light loss factor, as directed by the Engineer of Record.
    - c. The printout shall show any additional energy and/or energy costs, for a ten year period, as compared to the originally specified item. The total costs for these expenses will be deducted from the contract cost.
- D. Conflicts between catalog numbers and lighting fixture descriptions shall be brought to the attention of the Lighting Consultant prior to bid time for clarification.
- E. All lighting fixture voltages shall be verified by the contractor prior to ordering.
- F. "?" characters in the lighting fixture model number indicate a lighting fixture option that the contractor must identify prior to ordering/providing submittals.
- G. "No Known Equal" lighting fixture pricing/bidding notes:
1. Each lighting fixture identified as "No Known Equal" on this project shall be bid in a "line item" format. A per unit material cost shall be provided for each "No Known Equal" lighting fixture. This price shall include lamps as well as all other required materials required for installation. The lighting fixture price quoted will be utilized,

prior to shop drawing approval, for "adding" and/or "deleting" any quantity of the lighting fixture.

2. A unit cost shall be submitted for each "No Known Equal" lighting fixture. Submit the pricing as part of the bid form on a separate 8 1/2" x 11" sheet.

#### 1.4 MOCK-UPS

- A. As part of the work of this specification, when called for in the Fixture Descriptions, and at no additional cost to the Owner, temporarily install, connect and adjust a reasonable number of lighting fixtures of each type specified for a particular mock-up. Order and store mock-up lighting fixtures, when approved, as necessary to complete the work, at the Contractor's expense.

#### 1.5 WARRANTY

- A. Special warranty specified in this Article shall not deprive the Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties of, other rights and remedies Owner may have under requirements of the Contract Documents.
- B. Emergency warranty repairs shall be performed within twenty-four (24) hours of notification when a system or component malfunctions during use.
- C. All warranty repairs shall be performed by qualified personnel in the regular employ of the manufacturer and shall not be subcontracted or assigned without the written consent of the client. In no case shall the manufacturer be relieved of responsibility for the performance of warranty repairs.
- D. Contractor shall guarantee all materials and workmanship related to the electrical installation for a minimum period of one year from the date that the Owner accepts the finished project. If the manufacturer's standard warranty is longer than one year, then that will constitute the warranty period. Any defects in materials or workmanship during this guarantee period shall be corrected by the contractor at no additional cost to the Owner.
- E. Ballasts: Provide manufacturer's warranty for a period of not less than five years. Warranty shall include parts and labor to replace defective ballasts.
- F. LED Drivers: drivers shall be provided and warranted as part of a complete luminaire or complete lighting system with remote driver.

### PART 2 - PRODUCTS

#### 2.1 MATERIAL AND FABRICATION

- A. Contractor shall provide all materials as detailed on drawings and/or schedules, and labor as required to achieve a complete and operating lighting system.

- B. All electrical material and equipment shall be new and in perfect condition when installed. All equipment shall be UL Listed listed, or labeled or certified by a nationally recognized testing laboratory. Materials shall be manufactured in accordance with applicable standards of ANSI and NEMA.
- C. Metal parts shall be free from burs, sharp corners and edges and shall be finished to prevent corrosion or discoloration.
- D. Sheet metal components shall be corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings shall be rigidly formed, weather and light-tight enclosures that will not warp, sag or deform in use.
- F. Exposed metal hardware shall be stainless steel.
- G. Finish: As specified. Concealed parts (lamp holders, yokes, brackets, etc.) shall be matte black.
- H. Plastic parts shall be resistant to yellowing and other changes due to aging, exposure to heat and ultraviolet radiation.
- I. Doors, frames and other internal access shall be smooth operating, free from light leakage under operating conditions. Doors, frames, lenses, diffusers and other pieces shall be prevented from falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.
- J. Reflectors shall be free of spinning lines, polished and finished with an anodic coating under the Alzak process. Compact fluorescent reflectors shall be low-iridescent.
- K. Lenses shall have uniform brightness throughout the entire visible area at angles from 45° to 90° from vertical, without bright spots or striations.
- L. Lighting fixtures that require protective lenses shall be provided with tempered glass.
- M. Adjustable lighting fixtures shall provide positive locking devices for both horizontal and vertical adjustments. Lighting fixture shall be capable of being relamped without readjusting aiming angle.
- N. All equipment shall be factory tested to ensure proper operation prior to shipment to job site.
- O. Aluminum electrical connections, lugs, wiring or components carrying primary voltage shall not be acceptable.
- P. Custom lighting fixtures shall require approval of a first article prototype to be submitted prior to fabrication. The purpose of this prototype will be to review finishes, lamp placement within the lighting fixture, lamp type and reflector shape or size. Modifications may be required as a result of the prototype review. These modifications and others that do not materially affect the cost of the lighting fixture shall be incorporated at no additional cost to the Owner.

- Q. Contractor shall provide all Material Safety Data Sheets required.
- R. Lighting Consultant specifically reserves the right to relocate any equipment or outlet at no increase in contract cost prior to its installation (in case of standard product) or release for manufacture (in the case of custom product), regardless of prior shop or design drawing review.
- S. Color filters shall be glass where indicated. Color shall be confirmed with Lighting Consultant prior to ordering. All gel tubes specified for fluorescent lighting fixtures shall include a UV filter or inhibitor.

## 2.2 LED FIXTURES

- A. All LEDs used in an LED fixture shall be of proven quality from an established and reputable LED manufacturer.
- B. Manufacturer shall utilize an advanced production LED binning process to insure consistency from fixture to fixture and project to project over time, while ensuring a reliable supply of LEDs from the supplier.
- C. LED fixtures shall meet lumen maintenance standards as defined in IESNA LM-80-08.
- D. Manufacturer shall provide optical performance, polar diagrams and photometric data in various formats including IES file format in accordance with IESNA LM-79-08.
- E. IES data must be available and downloadable from manufacturer's website.
- F. Test shall be performed to verify lumen output, life and color properties, CCT and CRI and shall be tested and measured in accordance with LM-80-08. Lumen depreciation shall be in accordance with LM-80-08. Lumen maintenance projections shall not exceed 6X of the available system-level lumen depreciation test data. The system shall; be rated at L70 for not less than 50,000 hours.
- G. Manufacturer shall provide a five (5) year warranty from date of substantial completion.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Contractor shall provide shipment of all lighting and related equipment to be delivered to the job site.
- B. Delivery of equipment to the job site shall be in clearly identified crates, cartons, or appropriate shipping containers as to item, quantity, and lighting fixture type.
- C. The Contractor shall notify Lighting Consultant of any provision of this specification that is in conflict with local or national codes and an addendum shall be issued to correct the specification. Local or national codes will take precedence.

- D. Contractor shall refer to architectural reflected ceiling plans for coordination of lighting fixture locations with mechanical and fire safety equipment. Where conflicts occur, Contractor shall coordinate with Architect prior to installing any of the systems.
- E. Lighting fixtures located in recessed ceilings with a fire resistive rating of 1 hour or more shall be enclosed in an approved fire-resistive rated box equal to that of the ceiling.
- F. Contractor shall be responsible for adjusting aperture rings on all recessed lighting fixtures to be flush with the finished ceiling.
- G. Locations of the lighting fixtures shall be per the architectural reflected ceiling plan(s) and shall be coordinated at time of rough in. Conflicts between the architectural reflected ceiling plan(s) and the electrical/lighting design plan(s) shall be brought to the attention of the Architect in writing prior to ordering lighting fixtures.
- H. Lighting design drawings represent the design intent of the equipment, devices, etc., to be connected and the circuits to which they are to be connected. Contractor shall install all conduit, j-boxes and additional hardware and devices as required for a complete and operating system.
- I. Contractor shall be responsible for verifying and providing all hangers, clips and necessary hardware to install the lighting fixture in the environment as shown on the architectural plans. All lighting fixtures shall be provided with all structural supports as required by the currently adopted issue of the Uniform Building Code, as well as any local codes.
- J. Contractor to verify lighting fixture mounting hardware is compatible with approved mounting conditions. Mounting conditions must allow for aiming and adjusting of lighting fixtures on site.
- K. Contractor shall provide all lamps, power supplies, drivers and/or transformers to ensure a complete and operating system.
- L. Lamps to be provided per lamp schedule.
- M. Contractor shall arrange for and provide temporary electric service during the focus and programming phase as well as required mock-ups.
- N. Contractor to provide a separate temporary work light system during installation and shall not use the specialty lighting as a supplement system for work light use.
- O. Contractor to include five minutes of after-dark aiming/adjusting time (two hours minimum) for any adjustable lighting fixture and for each individual lighting fixture head or lamp holder in a multi-fixture/multi-lamp assembly. Lighting fixtures to be aimed/adjusted per the direction of Owner, Architect and/or Lighting Consultant.
- P. All cove mounted lighting fixtures shall extend the full length of the cove. Contractor to field verify cove length(s) and order quantity of lighting fixtures as required.
- Q. All dimming branch circuits shall be provided with a dedicated neutral conductor for each zone/channel.
- R. Contractor to provide and install all accessories as specified.



- S. All conduit runs shall be concealed unless shown otherwise. Provide a pull line in all empty conduits.
- T. Contractor to supply adequate support including ladders, lifts or other equipment required to access lighting fixtures at the time for focus, including evening or night work as may be required due to schedule conflict or daylight impact.
- U. All lighting fixtures shall be mounted and supported in accordance with applicable safety standards and all national and local electrical and seismic codes.
- V. Contractor to replace all burned out or inoperative LED modules at the end of the construction phase prior to the focus and programming phase and again prior to Owner occupancy or project opening.
- W. Contractor shall visit site prior to bid date, to verify all existing conditions to be encountered in the installation of all new equipment, lighting fixtures, devices, feeders, etc. Exact installation method and requirements shall be verified and determined prior to bid date. Contractor shall immediately notify Lighting Consultant and/or Electrical Engineer of any required modifications that are not shown on the drawings. Submittal of bid indicates contractor is qualified to perform the intended work and is aware of the job conditions.
- X. All equipment, electrical characteristics, locations, and connection requirements shall be verified prior to any rough-in work.
- Y. Complete electrical system shall be grounded in accordance with NEC regulations.
- Z. Contractor shall perform all work in strict accordance with all local, national and seismic governing codes. Work not in conformance with applicable codes shall be brought into compliance at no additional cost to the Owner.
- AA. All lighting fixtures shall be mounted and supported in accordance with applicable industry and safety standards and all national and local electrical codes.
- BB. Contractor shall provide lighting fixture-mounting kits as required to suit the exact type of ceiling or condition to which they are mounted.
- CC. All lighting fixtures shall be supplied with accessories as listed and lamps.
- DD. Lighting Consultant's Project Manager will coordinate with Contractor and Owner to establish schedule for all focusing and programming of lighting system.
- EE. Contractor shall provide manpower and tools for final focusing and adjustment, under the Lighting Consultant's supervision, of all adjustable lighting fixtures after regular working hours, whenever necessary, at no additional cost to the Owner.
- FF. Contractor to protect lighting fixtures from finish construction, including but not limited to painting, spackling, sanding, etc. Remove protective covers only after completion of construction work.
- GG. Alzak reflectors should be cleaned only with a non-streaking, non-caustic agent recommended by the manufacturer. Reflectors damaged or impregnated with fingerprints shall be replaced at the Contractor's expense.

- HH. Contractor shall adhere to all local and state earthquake and seismic code requirements for installation and securing of lighting fixtures. Pendant lighting fixtures should be provided with swivel hang-straight as required by seismic code.
- II. Wall mount J-boxes for sconces are measured to the center of the box. Pendant lighting fixtures are measured from the bottom of the lighting fixture to the finished floor.
- JJ. Penetrations of all fire rated walls or ceilings shall be fire-rated in accordance with all local and national codes.
- KK. All dimmers, switches or any devices that are mounted above the chair rail in public areas must be mounted as close as possible to door or window openings so as not to interfere with Owner hung decor.
- LL. Contractor shall protect all walls, trim, floors, equipment utility lines and materials. When working on finished surfaces limit damage to the confines as much as possible and restore to the original condition all surfaces that are damaged because of the installation of the work.
- MM. Equipment, materials and supplies previously installed but removed for protection shall be replaced in original locations. Any materials damaged shall be replaced with new materials of like kind and quality.
- NN. Contractor shall do all drilling, cutting, channeling and patching required to install electrical work as indicated or herein specified. All holes, curbs, etc., in floors, ceilings, and walls shall be patched, unless indicated otherwise.
- OO. All conduit runs shall be concealed unless shown otherwise. Provide a pull line in all empty conduits.

### 3.2 COORDINATION

- A. Contractor shall give ample notice of any special openings required for placing equipment in the building, in order to avoid cutting of completed work.
- B. Contractor shall furnish the materials and labor for work included under this section in ample time, and in sufficient quantities so that all of the work may be installed in proper sequence to avoid unnecessary cutting of the floors and walls.
- C. The Contractor for the work of this specification shall confer with other Contractors engaged in the construction of the project whose work might in any way affect his installation, and shall arrange his installation in proper relation to other work and with architectural finish so that it will harmonize in service and appearance and so that there will be no interference with the work of others, including interference in location or level. Arrange scheduling of work to prevent work of this section being damaged by other subsequent construction operations. Remove and replace any work so damaged at no cost to the Owner.

### 3.3 ACCESSIBILITY

- A. Contractor shall install equipment such as junction and pull boxes, lighting fixture housings, transformer, ballasts, drivers, switches and controls, and other apparatus that must be reached from time to time for operation and maintenance, to be easily accessible.
- B. Although the location of equipment included in the work of this section may be shown on the drawings in a certain place, actual construction may disclose that the location for this work does not make its position easily and quickly accessible. In such cases, the Contractor shall call the Consultant's attention to this situation before installing this work, and make the installation by his/her instructions.

### 3.4 FIELD QUALITY CONTROL

- A. Contractor shall inspect each unit for damage and promptly replace damaged units. All units should be inspected when received to allow proper time for replacement of any damaged units.
- B. Contractor shall remove protective plastic covers from lighting fixture diffusers only after construction work, painting and clean up are completed. Remove all dirty lamps, reflectors and diffusers; clean and reinstall.

### 3.5 SUPPORTS

- A. Contractor shall provide supports for lighting fixtures that are adequate to support the weight of the lighting fixtures.
- B. Contractor shall provide visible hanging devices that are finished to match the lighting fixture finish, unless indicated otherwise.
- C. Contractor shall provide supporting members that are surface passivated, and which are primed or paint-dipped to resist corrosion.
- D. Contractor shall provide fastening devices of a positive locking type, which do not require special tools to apply or remove them. Do not use tie wires in place of fastening devices.
- E. The Contractor providing the lighting fixtures is responsible for the necessary suspension system; the Contractor installing the lighting fixtures must ascertain the structural reliability of supports provided under other sections of this specification.
- F. Contractor shall provide pendant or surface mounted lighting fixtures with required mounting devices and accessories, including hickey, stud-extensions, ball aligners, canopies and stems. Hanging devices must comply with code requirements.
- G. Contractor shall provide hanging devices that, if visible from normal viewing angles, exactly match lighting fixtures' finishes.

### 3.6 ADJUSTMENTS

- A. Contractor shall provide manpower and tools for final focusing and adjustment, under the Consultant's supervision, of all adjustable lighting fixtures after regular working hours, whenever necessary, at no additional cost to the Owner.

### 3.7 CLEANING

- A. Immediately prior to occupancy, Contractor shall clean reflector cones, reflectors, aperture plates, lenses, louvers, lamps and decorative elements. Destaticize lenses after cleaning, installing them to leave no finger or dirt marks.
- B. Upon completion of the installation of lighting fixtures, and at the time of final inspection, all lighting fixtures must be clean, and free from marks, dust, spotting or other defects. Replace any broken or defective parts prior to final inspection. Contractor shall replace or make good all defects revealed by final inspection.

### 3.8 AS-BUILT DOCUMENTATION

- A. Contractor shall provide Complete Maintenance Manuals to Owner including, but not limited to:
  - 1. Required maintenance check-off schedule.
  - 2. Original Manufacturer's Equipment (OME) technical data sheets.
  - 3. Detailed operating procedures.
  - 4. A list of recommended spare parts and lamps.
  - 5. Installation wiring diagrams.
  - 6. Shop drawings
  - 7. Installation and/or construction As-Built drawings, including focus notes, hookup and dimmer schedules and color references for each lighting fixture.
  - 8. Owner's manuals for all automated luminaries.

END OF SECTION

section 27 10 00  
structured cabling system

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes the structured cabling system which shall include permanently installed backbone and horizontal pathway cabling, outlet assemblies, hardware for terminating and interconnecting.
- B. Products Installed Under this Section: Only new equipment and material, produced by manufacturers that are recognized nationally by the technology industry and approved by Underwriters Laboratory shall be used as specified in this Section or on the Drawings.
  - 1. All mounting hardware
  - 2. All mounting brackets
  - 3. All power cords
  - 4. All fiber and copper patch cords
- C. Related Sections
  - 1. Division 01
  - 2. Section 27 50 00: Integrated Communication System
  - 3. Section 28 16 00: Intrusion Alarm System

1.02 REFERENCES

- A. NEMA – National Electrical Manufacturer’s Association
- B. ANSI – American National Standards Institute
- C. NEC – National Electric Code
- D. RSEF – Relevant State Electrical and Fire Codes
- E. IEEE – Institute of Electrical and Electronic Engineers
- F. UL – Underwriters Laboratories, Inc.
- G. ANSI/TIA – 568-C.0, Generic Telecommunications Cabling for Customer
- H. ANSI/TIA – 568-C.1, Commercial Building Telecommunications Cabling Standard
- I. ANSI/TIA – C-2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard
- J. ANSI/TIA – C.2-1, Transmission Performance Specifications for 4-pair 100 ohm Category 6 Cabling, providing the accuracy requirements for Level III field testers; Category 6
- K. ANSI/TIA – C.3, Optical Fiber Cabling Components Standard
- L. ANSI/TIA – 569A Commercial Building Standard for Telecommunications Pathways and Spaces

STRUCTURED CABLING SYSTEM

- M. ANSI/TIA – 606 The Administration Standard for the Telecommunications Pathways and Spaces
- N. ANSI/TIA – 607 Commercial Building Grounding and Bonding Requirements for Telecommunications
- O. ANSI/TIA – 598 Color Coding of Optical Fiber Cables
- P. BICSI – Building Industry Consulting Service International publications:
  - 1. Telecommunications Distribution Methods Manual
  - 2. LAN and Internetworking Design Manual
  - 3. Telecommunications Cabling Installation Manual
  - 4. Customer Owned Outside Plant Design Manual
  - 5. Manufacturer's recommendations and installation guidelines
- Q. All cabling shall comply with all appropriate requirements of NEC Articles 770 and 800 and shall comply with the State Fire Codes as interpreted by the State Fire Marshall's Department.
- R. All publications referred to in this document shall be the latest publicized edition1.03 Definitions.

#### 1.03 DEFINITIONS

- A. Main Distribution Frame (MDF)
  - 1. A physical concentration or central location for terminating backbone cables to interconnect with local exchange carrier (LEC) equipment at the activity minimum point of presence. The MDF generally includes vendor specific components to support voice and data circuits, building surge protector assemblies, main cross connect blocks, equipment support frames, and plywood backboard (if MDF is wall mounted). Depending upon local site conditions, the MDF and IDF may be identical.
- B. Intermediate Distribution Frame (IDF)
  - 1. An intermediate termination point for horizontal wiring and cross connections normally within another structure separate from the MDF.

#### 1.04 SUBMITTALS

- A. Certificates
  - 1. Contractor shall hold and maintain manufacturer's certification for the Structured Cabling System.
    - a. Installers shall be CommScope Systimax certified or TE/AMP ND&I certified, Hubbell-Premise certified or District approved equal for copper horizontal cabling and Corning certified or District approved equal for Fiber. Include written certification from users that systems have performed satisfactorily for not less than 18 months.
  - 2. The Contractor must be certified with the manufacturer for the Structured Cabling System for at least twelve (12) months prior to bid.

### STRUCTURED CABLING SYSTEM

3. The Contractor shall provide proof of manufacturer's certification to the District.
4. At minimum, the Contractor's qualifications for manufacturer's certification shall include:
  - a. For moves, and changes to existing installed structured communications cable systems, Contractor shall be certified by same manufacturer as existing system.
5. Provide BICSI Registered Communications Distribution Designer (RCDD) approved drawings complete with wiring diagrams and details required to prove that the distribution system shall properly support connectivity from the MDF to the IDF to the work area outlets.
6. Provide specific experience in installing and testing structured cabling distribution systems using fiber optic and Category 5e & 6 or higher, cabling systems. Provide current certification for installing technicians.
7. Contractor shall furnish documentation providing proof of calibration and latest software version of all test equipment.
8. Provide a complete and detailed test plan for the structured cabling system including a complete list of test equipment for the Category 5e, Category 6, and fiber optic cable components and accessories. Include procedures for validation, and testing. Provide current certification for testing technicians.
  - a. Furnish factory reel tests for fiber optic cables.
  - b. Cabling shall be fully terminated from end to end (installed in faceplates and installed into patch panels NEMA rated wall boxes and/or raceway). Prior to finalized testing, pretests will not be accepted as the final report.
  - c. Provide certification of staff to utilize listed testing equipment
  - d. Furnish factory test results for patch cords.
  - e. Include specific experience in installing and testing structured cabling distribution systems using fiber optic, Category 5e, and Category 6 cabling systems.

**B. Qualification Statements**

1. Provide Contractor's experience and qualifications, which shall include three (3) years of projects of similar complexity. Include names and locations of two projects successfully completed using an instructional classroom technology.
2. Provide documentation indicating Contractor has been in the telecommunications contracting business for a minimum of five (5) years under the same name and is located within two hundred (200) miles of the District.
3. Prior to installation, submit data of installer's experience and qualifications, which shall include 3 years on projects of similar complexity. Include names and locations of two projects successfully completed using fiber optic and copper communications cabling systems in similar environments.

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4. Installers shall be CommScope Systimax certified or CommScope Uniprise certified for copper systems and Corning NPI certified or CommScope certified for fiber systems. Include written certification from users that systems have performed satisfactorily for not less than 18 months.
  5. Include specific experience in installing and testing structured telecommunications distribution systems using fiber optic and Category 5e and Category 6 cabling systems.
- C. Refer to Section 01 33 00 for additional requirements.
- 1.05 CLOSEOUT SUBMITTALS
- A. Documentation to be submitted upon completion of system are:
1. Upon completion of installation, the Contractor shall prepare "as-built" drawings of the system. As-builts shall be minimum size of 30" by 42" reproducible drawings of each floor plan indicating exact device locations, panels, cable routes and wire numbers as tagged.
  2. Provide Electronic copy of "as-built" drawings in AutoCAD and PDF formats.
  3. Maintenance required and maintenance schedule.
  4. For each campus, provide one (1) plastic laminated schematic of structured cabling system showing cabling, IDFs, MDFs, and equipment rooms. Drawings shall depict the following:
    - a. Shop and As-Built drawings shall depict District approved structured cabling system identifications and administration labeling scheme.
    - b. As-Built drawings shall depict all final structured cabling configurations, including locations, cable counts and IDF locations after completion of structured cable installation.
  5. Electronic copies of Certification Test Results shall be provided in native and PDF format to the District Representative within ten days of cable installation completion.
  6. 25 Year Warranty of Structured Cabling System shall be provided to the District Representative within ten days of final Test Results. Coordinate with District Representative.
- B. Refer to Section 01 77 00 for additional requirements.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
- B. Repair or replace damaged components before Substantial Completion of the project.
- 1.07 WARRANTY
- A. The installation must be certified to meet the latest available manufacturer system warranty program requirements for an extended warranty of twenty five (25) years minimum duration. The performance warranty shall warrant the installed horizontal and backbone copper portion of the system and, as applicable, the installed

#### STRUCTURED CABLING SYSTEM

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horizontal and backbone fiber optic portions of the system. All such links and segments shall be warranted in accordance with the latest applicable requirements as defined by TIA.

- B. The Contractor shall warrant the workmanship and installation of the system for one (1) year.
- C. All major component failures must be replaced within a four-hour period. A major component shall be considered any component that affects fifty or more user devices.
- D. The Contractor must provide a four-hour response time to problem calls. Response time is defined as on-site presence of authorized maintenance personnel equipped with appropriate spare parts and diagnostic tools.
- E. During the warranty period, the Contractor shall maintain adequate stock of potential replacement parts to service the system should component failure occur.

## PART 2 - PRODUCTS

### 2.01 SYSTEM DESCRIPTION

- A. All new fiber optic cable and fiber optic patch cords, hardware and termination equipment shall be manufactured by Corning, or District approved equal.
- B. All new horizontal cabling, patch cords, hardware and terminating equipment shall be manufactured by CommScope Systimax, CommScope Uniprise, or District approved equal to best match existing manufacturer.
- C. All existing fiber optic cable, patch cords, hardware and termination equipment to be re-used shall be pulled back, bagged and protected in place. Testing parameters shall be followed according to Section 3.05 Testing.
- D. The horizontal and backbone cabling system includes the interconnecting cabling and sleeves between rooms, terminal hardware for connectivity between the MDF and/or IDFs and the work area outlet.
- E. The backbone system shall be wired in a star topology with the MDF at the center or hub of the star.
- F. Hardware and terminating equipment shall consist of UL approved; Category 6 patch panels, jacks, and fiber optic terminating equipment
- G. Backbone cable shall consist of indoor/outdoor plenum-rated, armored tight-buffered multimode fiber optic cable. Fiber optic cable shall be OMI 62.5/125µm. All fiber optic backbone shall not exceed a maximum distance of 275 meters (902 feet). All indoor/outdoor rated fiber optic cable shall be U.L. listed.
- H. Backbone cable over 275 meters shall consist of armored indoor/outdoor plenum-rated. Fiber optic cable requirements over 275 meters shall be based on SFP Port Cabling Specification Table.

| Product | Wavelength (nm) | Fiber Type | Core Size (µm) | Modal Bandwidth (MHz Km) | Operating Distance (m) |
|---------|-----------------|------------|----------------|--------------------------|------------------------|
|         |                 |            |                |                          |                        |

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|                |      |     |      |                  |  |
|----------------|------|-----|------|------------------|--|
| 1000BASE-SX    | 850  | MMF | 62.5 | 160 (FDDI-grade) | 220 (722 ft)                               |
|                |      |     | 62.5 | 200 (OM1)        | 275 (902 ft)                               |
|                |      |     | 50   | 400 (400/400)    | 500 (1,640 ft)                             |
|                |      |     | 50   | 500 (OM2)        | 550 (1,804 ft)                             |
|                |      |     | 50   | 2000 (OM3)       | 1000 (3281 ft)                             |
| 1000BASE-LX/LH | 1310 | MMF | 62.5 | 500              | 550 (1,804 ft)                             |
|                |      |     | 50   | 400              | 550 (1,804 ft)                             |
|                |      |     | 50   | 500              | 550 (1,804 ft)                             |
|                |      | SMF | –**  | –                | 10,000 (32,821 ft)                         |
| 1000BASE-EX    | 1310 | SMF | –**  | –                | 40,000 (131,234 ft)                        |
| 1000BASE-ZX    | 1550 | SMF | –    | –                | Approximately 70 km depending on link loss |
| 1000BASE-BX-U  | 1310 | SMF | –**  | –                | 10,000 (32,821 ft)                         |
| 1000BASE-BX-D  | 1490 | SMF | –**  | –                | 10,000 (32,821 ft)                         |
| GLC-BX40-D-I   | 1550 | SMF | –**  | –                | 40,000 (131,234 ft)                        |
| GLC-BX40-DA-I  | 1490 | SMF | –**  | –                | 40,000 (131,234 ft)                        |
| GLC-BX40-U-I   | 1310 | SMF | –**  | –                | 40,000 (131,234 ft)                        |

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|              |      |     |     |   |                     |
|--------------|------|-----|-----|---|---------------------|
| GLC-BX80-D-I | 1570 | SMF | -** | - | 80,000 (262,467 ft) |
| GLC-BX80-U-I | 1490 | SMF | -** | - | 80,000 (262,467 ft) |
| GLC-GE-DR-LX | 1310 | SMF | -** | - | 10,000 (32,821 ft)  |

## 2.02 STRUCTURED CABLING

- A. Cabling shall be UL listed for the application and shall comply with TIA/EIA-568 (most current) standards and NFPA 70. Provide a labeling system for cabling as required by TIA-606 (most current) standards and District Standards. Cabling manufactured more than 12 months prior to date of installation shall not be used.
- B. Horizontal Cabling
  1. Shall consist of Category 6 UTP four pair cables.
  2. Shall match criteria and performance ratings of the existing horizontal cables.
  3. Shall be plenum rated or OSP rated when installed in underground conduits.
  4. The maximum distance between the telecommunications outlet and the horizontal cross connect shall be no more than 90 meters. The maximum total length of all patch cords and jumpers in the telecommunications closet and at the work area shall be no more than 10 meters.
  5. Shall comply with NFPA 70 and performance characteristics in TIA-568 (most current) standards, four-pair ohm.
  6. All jumpers, patch cords, equipment cords, connecting hardware and connectors shall meet all applicable standards as specified in ANSI/TIA 568-C.2 and C.3.
  7. Category 6 rated cable for local area networks shall exceed ANSI/TIA-568 (most current) standards.
  8. Cable jacket shall be Blue (Systimax, CommScope Uniprise, or District approved equal) for Structured Cabling System.
  9. Cable jacket shall be Aqua (Belden, Hubbell or District approved equal) Category 6 for Intercom and Clock system.
  10. Yellow (Systimax, CommScope Uniprise, or District approved equal) Category 6 for Camera system.
  11. Each jack, where it is a spare or intended to serve a telephone or analog line, should be fed by four-pair, Category 6 cable, solid annealed copper conductor.
- C. Fiber Optic Multimode Backbone Cabling – NOT REQUIRED ON THIS PROJECT

### STRUCTURED CABLING SYSTEM

1. Shall be indoor/outdoor (plenum rated only where required by code), loose tube 12 strands minimum, OM1 62.5/125µm.
- D. Fiber Optic Cabling – NOT REQUIRED ON THIS PROJECT
1. All armored indoor/outdoor rated tight-buffered fiber optic cable shall be plenum rated and U.L. listed.
  2. All Multimode fiber optic backbone cable shall not exceed a maximum distance of 275 meters.
  3. New fiber optic backbone cable shall consist of armored indoor/outdoor plenum rated Multimode OM1 62.5/125µm fiber optic cable.
  4. Backbone cable over 275 meters (902 feet) shall consist of armored indoor/outdoor, plenum rated cable. Fiber optic backbone cable requirements over 275 meters shall be based on Section 2.01.H, SFP Port Cabling Specification Table.
- E. Category 6 Patch Cables
1. UTP Patch Cables. Patch cables for unshielded twisted pair cable shall be Category 6 and shall be same manufacturer as horizontal cabling and shall be equipped with factory-attached connectors to interconnect equipment mounted on the racks of the distribution frame and to connect computer stations to outlet locations.
  2. Quantity of patch cords required for 100% port population at both ends with 15% spare.
  3. Patch cord footage shall be determined by the Contractor and verified with the District Representative.
  4. Unless otherwise stated, the Structured Cable Contractor shall deliver:
    - a. MDF/IDF Patch Cords
      - i. Blue in color for Structured Cabling (Category 6)
      - ii. Yellow in color for CCTV (Category 6)
      - iii. Aqua in color for Intercom/clock (Category 6)
      - iv. White in color for Wireless access points (Category 6)
      - v. All new cables to match existing colors if existing cables are to remain
    - b. Workstations – Category 6, blue in color, 20 foot length.
    - c. CCTV– footage determined by Contractor, Category 6, yellow in color.
    - d. Intercom/Clock – footage determined by Contractor, Category 6, Aqua in color.
    - e. Wireless Access Points – 2 feet in length Category 6, white in color
- F. Fiber Optic Patch Cables – NOT REQUIRED ON THIS PROJECT

#### STRUCTURED CABLING SYSTEM

1. Fiber Optic Patch Cables shall be multimode patch cords pre-made to connect fiber optic equipment with fiber optic cross connects, interconnects and outlets.
2. Shall be manufactured by Corning or CommScope.
3. The patch cords (jumpers) shall be impact-resistant, duplex fiber cables with LC to SC connectors, of the same performance characteristics as the multimode fiber backbone being connected.
4. Fiber patch cords footage shall be determined by the Contractor and verified with the District Representative.
5. These fiber optic patch panel connections shall provide 0.4 dB or less insertion loss and provide connection between the Active LAN devices and the Fiber Optic patch panel. Quantities for 100% fiber strand population at both ends plus 15% spares.
6. Unless otherwise stated the Structured Cable Contractor shall deliver:
  - a. IDF Patch Cords – LC - SC connectorized, multimode, duplex, fiber optic patch cord.
  - b. MDF Patch Cords – LC - SC connectorized, multimode, duplex, fiber optic patch cord.

## 2.03 PATCH PANELS

### A. Copper Patch Panels

1. Patch panels shall be rack mounted, rated to exceed TIA Standard for Category 6 modular patch panels, each wired to terminate modular jacks per the TIA T568B standard.
2. Quantities of jacks are based on the number of Category 6 cables originating at wall outlets and terminating at the patch panel plus 15% spares.
3. 48-port patch panels need to be equipped with label windows above each patch panel port.
4. All patch panels shall be 48-port capacity unless there is insufficient rack space or district specifies otherwise.
5. Patch panels shall be black in color.
6. Copper Patch Panel Manufacturer: CommScope Systimax, or CommScope Uniprise.

## 2.04 CABLE MANAGEMENT – NOT REQUIRED ON THIS PROJECT

- A. All equipment cabinets shall be equipped with horizontal cable management organizers for each fiber optic patch panel and Category 6 patch panel.
- B. Horizontal cable managers shall be designed to extend past the frame to allow placement of equipment in any position within the rack. When mounted between equipment rack frame rails, they shall be securely mounted to equipment rack frame rails.
- C. All equipment cabinets shall be equipped with horizontal cable management organizers for each fiber optic and UTP patch panel.

## STRUCTURED CABLING SYSTEM

- D. Horizontal cable managers shall be single-sided with black finish and be 2 rack units (2U) in height. Horizontal cable equipment shall have cable pass-through, removable hinged cover and evenly spaced "fingers" designed to maintain and allow the entry and exit of jumper, patch or cross-connect cables and/or wires in place.
- E. Horizontal Cable Manager Manufacturer: CommScope Systimax, or CommScope Uniprise.

#### 2.05 FIBER OPTIC PATCH PANELS – NOT REQUIRED ON THIS PROJECT

- A. Provide Patch Panels for maintenance and cross connecting of fiber optic cables.
- B. Patch panels shall be constructed of 0.125-inch minimum aluminum and shall have connectors which interface the inside plant fiber optic jumper cable with the outside plant fiber optic cable.
- C. Patch panels shall be equipped with engraved laminated plastic nameplates above each connector.
- D. Rack-mounted fiber patch panels shall be equipped to terminate or splice the incoming inter-building fiber and any required backbone or interconnect cables.
- E. Each cable must be properly dressed.
- F. These patch panels will terminate the fiber optic cables, provide a place for jumper cables and will provide room to terminate additional optics.
- G. Patch panels shall provide capacity for minimum of 12 fiber optic strands. Larger capacity patch panels shall be determined at site walks.
- H. Patch panels shall be 100% populated with type SC couplers and adapter plates. All connectors and couplers will be type SC.
- I. The fiber optic patch panel connections shall provide 0.4 dB or less insertion loss.
- J. Fiber Optic Patch Panel Manufacturer: Corning or CommScope

#### 2.06 WALL MOUNTED EQUIPMENT SUPPORT CABINET – NOT REQUIRED ON THIS PROJECT

- A. Cabinet shall be fully enclosed lockable, modular type steel construction and treated to resist corrosion.
- B. Cabinet shall have a minimum weight capacity of 300 lbs.
- C. IDF cabinets shall be wall mount/swing out type and provide 19" rack mounting.
- D. Rack shall be designed to allow for left or right-hand swing. Dimensions shall be a minimum of 36"H X 23" W X 30" D.
- E. In selected cases, a 48" high cabinet will be used. Larger cabinet size will be determined on a project-by-project basis.
- F. Cabinet shall be mounted on plywood backboard in location to be determined.
- G. Contractor shall be responsible for determining correct cabinet mounting and anchoring methods that will safely support the combined weight of the cabinet and data network components including UPS and battery systems that will occupy the cabinet. UPS to be mounted outside the cabinet.
- H. Cabinet mounting and anchoring methods shall comply with the District Representative and State building and safety codes.

### STRUCTURED CABLING SYSTEM

- I. When wall mounted cabinets are installed in classrooms, the Contractor shall responsible for providing and installing Acoustical Absorber foam material on inside, back of cabinet. Acoustical Absorber shall be flexible, ½" thick, polyurethane, adhesive backed foam.
- J. Drywall screws shall not be used for mounting of cabinets.
- K. Contractor shall be responsible for ensuring that cabinet mounting and anchoring methods are per manufacturers recommendations. Manufacturer: Hoffman Access Plus II Type 1 Double-Hinged Wall-Mount Cabinet or District approved equal.
- L. Contractor shall be responsible for proper grounding of the cabinets per the most current 607 standard.
  - i. Rack / Cabinet horizontal busbar Hubbell # HGRKTHC or District approved equal.
  - ii. Device ground kit Hubbell # HGRKD###N (## - length in inches) or equal per device installed.
  - iii. Ground conductor Kit Hubbell # HGRKTDA##DA (## - length in inches) or equal for cabinet grounding to electrical service panel or building steel.

## 2.07 MDF EQUIPMENT CABINETS/FREE STANDING – NOT REQUIRED ON THIS PROJECT

- A. The unit shall be designed to provide a secure, managed environment for computer and networking equipment.
- B. The unit shall conform to EIA-310D Standard for Cabinets, Racks, Panels and Associated Equipment and accommodate industry standard 19" rack mount equipment.
- C. The unit shall be designed with four (4) vertical posts to allow rack mount equipment installation utilizing four (4) vertical mounting rails.
- D. The unit shall provide 42U of equipment vertical mounting space (1U=1.75" or 44.45mm).
- E. The vertical mounting rails shall be adjustable to allow different mounting depths.
- F. The unit shall include at least 60 sets of mounting screws, caged nuts, bolts and cup washers, and caged nut installation tool for the mounting of equipment inside the unit.
- G. Both front and rear doors shall consist of quick release hinges allowing for quick and easy detachment without the use of tools.
- H. The front and rear doors shall open a minimum of 180 degrees to allow easy access to the interior.
- I. The front and rear doors shall be reversible so that it opens from either side.
- J. The base unit shall include removable side panels that are removed without tools using easy finger latches for fast access to cabling and equipment.

## STRUCTURED CABLING SYSTEM

- K. All weight bearing components shall be constructed from steel no less than 0.9mm (20 gauges).
- L. All metal parts shall be painted using a powder coat paint process.
- M. Plastic materials shall comply with Underwriters Laboratory Specification 94 with V-1 rating (UL94 V-1) or better.
- N. Provisions shall be provided for all enclosure panels and rack-mounted equipment to be earthed or grounded directly to the frame.
- O. Unit shall include a grounding kit containing terminated green/yellow jumper wires and associated hardware.
- P. Units shall be equipped with vertical wire management rings, not to exceed 12" between rings, installed at both the front and rear of the cabinet.
- Q. Each cabinet installed shall have one (19"Wx3"Dx3"H) horizontal wire manager installed at top/rear portion of the cabinet.
- R. Units shall be equipped with perforated front and rear doors, perforated top and solid side panels.
- S. Baying brackets shall be provided where mounting multiple cabinets are to be mounted together.
- T. Cabinet Frame with front and rear mesh doors.
- U. "Side Panels" required.
- V. Unit shall have base dimension of 84 inches in height by 31.50 inches in width by 41.86 inches in depth.
- W. Units shall be black in color.
- X. Cabinets shall be seismic/earthquake braced and anchored to floor.
- Y. Each campus MDF shall include two, free standing equipment server cabinets..
- Z. Manufacturer: Tripplite SR2400 or District approved equal.
- AA. Contractor shall be responsible for proper grounding of the cabinets per the most current 607 standard.
  - 1. Rack / Cabinet vertical busbar Hubbell # HGRKTV or equal.
  - 2. Device ground kit Hubbell # HGRKD##N (## - length in inches) or equal per device installed.
  - 3. Ground conductor Kit Hubbell # HGRKTDA##DA (## - length in inches) or equal for cabinet grounding to electrical service panel or building steel.
  - 4. Ground conductor Kit Hubbell # HGRKTDA##DA (## - length in inches) or equal for cabinet busbar grounding to electrical service panel or building steel.

2.08 MDF / IDF Open 4 Post Equipment Rack(s) free standing – NOT REQUIRED ON THIS PROJECT

#### STRUCTURED CABLING SYSTEM



- A. The unit shall conform to EIA-310 Standard for Cabinets, Racks, Panels and Associated Equipment and accommodate industry standard 19" rack mount equipment.
- B. The unit shall be designed with four (4) vertical posts to allow rack mount equipment installation utilizing four (4) vertical mounting rails.
- C. The unit shall provide a minimum of 45 Rack Units of equipment vertical mounting space (1U=1.75" or 44.45mm).
- D. The unit shall include at least 60 sets of mounting screws, caged nuts, bolts and cup washers, and caged nut installation tool for the mounting of equipment inside the unit.
- E. Baying brackets shall be provided where mounting multiple cabinets are to be mounted together.
- F. Unit shall have base dimension of 84 inches in height by 20.25 inches in width by 30 inches in depth.
- G. Units shall be black in color.
- H. Cabinets shall be seismic/earthquake braced and anchored to floor.
- I. All weight bearing components shall be constructed from steel no less than 0.9mm (20 gauges).
- J. All metal parts shall be painted using a powder coat paint process.
- K. Plastic materials shall comply with Underwriters Laboratory Specification 94 with V-1 rating (UL94 V-1) or better.
- L. Provisions shall be provided for all rack-mounted equipment to be earthed or grounded directly to the frame.
- M. Unit shall include a grounding kit and all associated hardware.
- N. Manufacturers: Hoffman, Chatsworth, or District approved equal.
- O. Contractor shall be responsible for proper grounding of the cabinets per the most current 607 standard.
  - 1. Rack / Cabinet vertical busbar Hubbell # HGRKTV C or equal.
  - 2. Device ground kit Hubbell # HGRKD##N (## - length in inches) or equal per device installed.
  - 3. Ground conductor Kit Hubbell # HGRKTDA##DA (## - length in inches) or equal for cabinet grounding to electrical service panel or building steel.
  - 4. Ground conductor Kit Hubbell # HGRKTDA##DA (## - length in inches) or equal for cabinet busbar grounding to electrical service panel or building steel.

## 2.09 MDF EQUIPMENT CABINET POWER DISTRIBUTION STRIP – NOT REQUIRED ON THIS PROJECT

- A. Each equipment cabinet shall come equipped with two 5-foot power distribution strips with (10) 20 amp (NEMA 5-20R) receptacles mounted 6 inches on center.

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- B. MDF Cabinet Mounted LCD Monitor/Keyboard Drawer – NOT REQUIRED ON THIS PROJECT
1. Contractor shall provide and install one rack-mounted LCD monitor/keyboard drawer at MDF cabinet location designated by District Representative.
  2. Unit shall include full Size Keyboard, Energy Saver, adjustable mounting depth, Integrated Trackball, Low Cooling Requirements, Low Power Consumption, On-Screen Display (OSD) adjustments, PC mouse/keyboard/video support, PS/2 terminations, and Standard VGA termination.
  3. Characteristics: LCD monitor/keyboard shall be:
    - a. Rack mounted LCD monitor/keyboard drawers shall only 1U (1.75") of rack space.
    - b. 1024 X 768 Resolution, 15" TFT active matrix screen.
    - c. Unit shall include cable management arm, mounting hardware, Qty 1 - IEC to IEC 320 Power Cord, Qty 1 - IEC to NEMA 5-15P Power Cord.
    - d. Nominal input voltage shall be 100, 120, 208, 230, 240 V.
    - e. Input frequency (Hz) shall be 50/60 Hz.
    - f. Input Connection Type shall be NEMA 5-15P, IEC-320 C14.
    - g. Unit shall be equipped with power cord 6 feet in length (1.83 meters).
    - h. Manufacture: APC or District approved equal
  4. MDF Cabinet Sliding Equipment Shelves – NOT REQUIRED ON THIS PROJECT
    - a. Contractor shall provide and install two rail-mounted sliding equipment shelves within every cabinet installed.
    - b. Shall occupy 1U of rack space.
    - c. Shall be equipped to slide out.
    - d. Net Width 16.20 inches.
    - e. Net Depth 37.40 inches.
    - f. Color shall be black.
    - g. Manufacturer: Hoffman Net Series or District approved equal.
  5. MDF Cable Runway – NOT REQUIRED ON THIS PROJECT
    - a. Cable runway shall be installed in MDF Rooms. Size: 12 inch wide, plus side channel, as needed.
    - b. Classified by Underwriters Laboratories (UL) as suitable for equipment grounding.
    - c. Cable runway shall be used for voice and, or data and video communications cabling only. No electrical wiring shall be placed in cable runway with voice and data cabling.

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- d. Wall angle supports shall be steel angles. Ends to be smooth without hooks or projections. Brackets shall be able to support an end load of 600 lb. with a safety factor of 1.65.
- e. Elbows, Tee's, 90-degree bends and crosses: All horizontal and vertical 90-degree elbows, tees, 90-degree bends and crosses shall be made with right angle couplings, which clamp to the runway without the need for drilling or cutting.
- f. At all horizontal 90-degree bends, tees, and crosses, provide adjustable junction splice kits for large radius cable bends.
- g. Seismically supported by end wall supports, angular wall supports and communications equipment racks.
- h. Black baked enamel finish.
- i. Manufacturer: Chatsworth Products (12") or District approved equal.

#### 2.10 OUTLET / CONNECTOR ASSEMBLIES

- A. Jacks shall comply with FCC Part 68.5, and TIA/EIA-568 (most current) Standards.
- B. Jacks shall accommodate Category-6 or fiber optic cable and work in concert with Wiremold 5500 raceway or District approved equal.
- C. UTP jacks shall be RJ-45 designation T568B type, UL 1863 listed, eight position, constructed of high impact rated thermoplastic housing rated for 6 service.
- D. Jacks for data shall be Category-6 hardware and shall comply with the attenuation requirements contained in TIA/EIA-568 (most current) Standard.
- E. Jacks shall be
  - 1. Blue in color for data and telephone structured cabling.
  - 2. Yellow in color for CCTV.
  - 3. Aqua in color for Intercom/Clock.
- F. Telecommunications face plates shall comply with UL 514C, and TIA/EIA-568 (most current) standard; flush design constructed of high impact thermoplastic material.
- G. Structured cabling faceplate colors shall be ivory. Structured cabling faceplates shall be available in 2-port, 4-port and 6-port single-gang configurations.
- H. All unused faceplate openings shall have blanks installed.
- I. Stenciled lettering for voice and data circuits shall be provided using thermal ink transfer process.
- J. Jacks shall be orientated on the patch panel staring at the top left and proceeding in a left to right top to bottom order.

#### 2.11 NON-METALLIC SURFACE MOUNTED RACEWAY

- A. Conceal cable sleeves within walls whenever possible.
- B. Unless otherwise indicated, raceway shall be three channel, Wiremold 5500 or District approved equal with all necessary brackets, adapters, connectors, hardware

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and equipment to install Systimax, CommScope Uniprise, or district approved equal, certified Structured Cabling systems as described above.

- C. Raceway shall be ivory in color or as noted on drawings.
- D. Notching or modifications of raceway will not be permitted.
- E. Proper screws and anchors shall be used to mount raceway.
- F. Manufacturer: Wiremold or District approved equal.

## 2.12 NON-CONTINUOUS CABLE SUPPORT

- A. Material
- B. Contractor shall provide and install all non-continuous cable supporting hardware.
- C. Non-continuous cable supporting hardware consists of J-hooks, multi-function clips, beam clamps, etc. Bridle rings or zip ties are not permitted.
- D. Non-continuous cable supports shall provide a load bearing surface of sufficient width to comply with required bend radii of high-performance cables; UL Listed. Bridle rings are not permitted.
- E. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
- F. Non-continuous cable supports sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
- G. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
- H. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; UL Listed.
- I. If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips, etc.
- J. Tee-bar support bracket with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- K. Fastener to wire/rod with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- L. Fastener to beam or flange with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- M. Fastener to C or Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- N. Fastener to wall, concrete, or joist with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.

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- O. Fastener to threaded rod with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments.
- P. The multi-tiered support bracket shall have a static load limit of 300 lbs.
- Q. U-hooks and double J-hooks shall attach directly to threaded rod using standard nuts.
- R. Manufacturer: Copper B-Line, Erico Caddy, Doc's J-Hooks or District approved equal.

#### 2.13 BACKBOARDS

- A. When NEW IDF cabinets are indicated on the plan drawings, provide fire rated plywood 3/4 inch thick A/C Grade, 36"H X 24" W for mounting of wall mounted cabinets.
- B. Backboards shall be painted with a light color, nonconductive fire-resistant overcoat. Backboards shall be free of voids; fill and sand prior to painting.
- C. Cabinet shall be mounted on plywood backboard in location to be determined.
- D. Contractor shall be responsible for determining correct backboard mounting and anchoring methods that will safely support the combined weight of the backboard, cabinet and data network components that will occupy the backboard.
- E. Backboard mounting and anchoring methods shall comply with the District Representative and State building and safety codes.
- F. Contractor shall be responsible for ensuring that cabinet mounting and anchoring methods that comply with manufacturers recommendations.
- G. Drywall screws shall not be used to mount plywood backboards.

#### 2.14 GROUNDING AND BONDING PRODUCTS

- A. Comply with UL 467, ANSI/J-STD--607 (most current) standard, and NFPA 70. Components shall be identified as required by TIA/EIA-606 (most current) standard.
  - 1. Manufacturer: Hubbell or district approved equal.
- B. MDF
  - 1. All NEW MDF Racks identified on the plan drawings shall be installed with a Grounding Busbar (TGB)
    - a. The TGB shall be installed in accordance with ANSI/J-STD--607 (most current) standard.
    - b. The TGB shall be grounded to the nearest access to the building ground with a #6 AWG insulated conductor.
  - 2. Building ground is identified as main building electrical ground, building structural steel, or ground rod. Water pipes, gas pipes and electrical conduits are not acceptable ground attachment points.
  - 3. Ground conductors are not to exceed 40'. If building ground connection is beyond 40', Contractor is to install a new ground round at the nearest outside location. Ground rod location shall be approved by District Representative prior to installation.

### STRUCTURED CABLING SYSTEM

4. Provide ohms testing for ground. Ground connections shall not exceed 5 ohms.
- C. IDF
1. IF SHOWN ON PLANS, all IDFs shall be installed with a grounding busbar (TGB) the TGB shall be installed in accordance with ANSI/J-STD--607 (most current) standard. The TGB shall be grounded to the nearest building ground with a #6 AWG insulated conductor.
  2. Building ground is identified as main building electrical ground, building structural steel, or ground rod. Water pipes, gas pipes and electrical conduits are not acceptable ground attachment points.
    - a. Ground conductors are not to exceed 40'. If building ground connection is beyond 40', Contractor is to install a new ground round at the nearest outside location. Ground rod location shall be approved by District Representative prior to installation.
    - b. Provide ohms testing for ground. Ground connections shall not exceed 5 ohms.

#### 2.15 FIRESTOPPING MATERIAL

- A. Contractor shall provide all necessary fire stopping of openings through which cable is installed under this specification, in accordance with NFPA 70 and all local codes. This includes installation in conduits, raceways, or bare penetrations. Provide and install UL 1479 approved (Fire Barrier Caulk) firestop material.
1. Manufacturer: 3M, STI or District approved equal.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Coordinate layout and installation of voice, data, and video communication cabling with the District Representative, other Contractors, and equipment suppliers.
- B. Structured Cable Contractor shall attend weekly project meetings.
- C. Meet jointly with other Contractors, equipment suppliers, the District Representative in order to exchange information and agree on details of equipment arrangements and installation interfaces.
- D. Record agreements reached in meetings and distribute to other participants in a timely manner.
- E. Adjust arrangements and locations of distribution frames, cross-connect and patch panels in equipment rooms and/or MDF/IDF rooms to accommodate and/or optimize the arrangement and space requirements of voice and LAN equipment.

#### 3.02 INSTALLATION

- A. Structured cabling systems, including the horizontal and backbone cable, outlet/connector assemblies, and associated hardware shall be installed in accordance with TIA/EIA-568 (most current) standard, TIA/EIA-569-A, NFPA 70, and UL standards as applicable.

### STRUCTURED CABLING SYSTEM

- B. If MDF and/or IDF do not have adequate capacity to support additional cable and termination hardware, Contractor shall provide and install new MDF/IDF cabinet/rack or add to existing IDF equipment.
- C. Contractor shall provide all necessary tools and materials not specified, (Velcro wraps, "d" rings, screws, consumables, hardware, etc.) and equipment, (ladders, hydraulic lifts, storage containers, etc.) necessary to provide a complete and operating system.
- D. The designated District Representative shall be provided progress reports.
- E. Periodic on-site inspections will be done during the course of installation.
- F. Screw terminals shall not be used except where specifically indicated on plans.
- G. Do not untwist Category 6 UTP cables more than 1/4 inch from the point of termination to maintain cable geometry.
- H. Do not exceed manufacturers' cable pull tensions for copper and fiber optic cables. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for four pair copper cables.
- I. Do not chafe or damage outer jacket materials.
- J. Use only lubricants approved by cable manufacturer for outside rated cable. Lubricants for inside rated cable not approved.
- K. Do not over cinch cables, or crush cables with staples.
- L. For Category 6 UTP cable, bend radii shall not be less than four times the cable diameter.
- M. Contractor shall install new 1/4" pull rope in all conduits at MDF/IDF.
  - 1. Pull rope shall be new 1/4" polypropylene over polyester rope with a minimum 1700 lb. Tensile strength.
  - 2. Pull rope shall be new material that is free of knots, kinks, and abrasions and shall be placed as a single continuous length in every new conduit.
  - 3. Pull rope shall be secured at each end.

### 3.03 DATA SYSTEMS LABELING PROCEDURES

- A. The labeling shall be in accordance with the TIA/EIA-606 (most current) standard.
- B. The labeling shall be computer software generated and printed with readable fonts and black ink.
- C. The ink and label shall be water and smear-proof for both indoor and outdoor use.
- D. Samples of each type of media showing label type, labeling format, font size and ink shall be submitted for District Representative approval.

### 3.04 DATA SYSTEMS LABELING

- A. The data systems labeling shall include all related equipment, cables, racks and work area outlets.
- B. Label all cables no more than 6" from each end of the cable designating the rack and room number.

## STRUCTURED CABLING SYSTEM

- C. The labeling shall be delineated on any riser diagrams, floor plans and test reports.
- D. The labeling shall be computer software generated and printed with readable fonts and black ink on white background.
- E. Patch Panels
  - 1. Patch Panels will be provided with a factory lettering located above the ports with port number and factory installed field labels installed below the ports.
  - 2. The patch panel port labels will identify the room station end room number and outlet number.
- F. Outlets
  - 1. Outlets will be provided with factory labels identifying MDF or IDF and its room number, and related patch panel port number.

### 3.05 TESTING

- A. Structured Cabling Testing
  - 1. Perform structured cabling inspection, verification, and performance tests in accordance with TIA/EIA-568 (most current) standard.
  - 2. Permanent link testing shall be performed on all cabling.
  - 3. All testing personnel shall be trained on testing equipment tools to assure that complete and accurate testing results are obtained/provided.
  - 4. All test equipment shall be calibrated no more than 12 months prior to cable test date. Test equipment shall have the latest software update/release from the test equipment manufacturer.
- B. Inspection
  - 1. Visually inspect cabling jacket materials for UL or third party certification markings.
  - 2. Visually inspect plenum rated Category 6 UTP cable and Indoor/Outdoor plenum rated fiber optic cable jacket materials for UL or third party certification markings.
  - 3. Inspect cabling terminations in MDF/IDF rooms and at workstations to confirm color code for tip and ring pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568 (most current) standard.
  - 4. Visually confirm Category 6 marking of outlets, cover plates, jacks, and patch panels.
- C. Verification Tests
  - 1. Perform 100MHz for Cat. 5e and 250 MHz for Cat.6, near end cross talk (NEXT) and attenuation tests systems installations.
  - 2. Perform fiber optic end-to-end attenuation tests using a power meter light source and manufacturer's recommended test procedures. Perform tests in accordance with EIA/TIA-526-14, Method B for horizontal, multimode fiber. Perform verification acceptance tests and factory reel tests.

## STRUCTURED CABLING SYSTEM



D. Performance Tests

1. Category 5e and 6 cable tests.
2. Category 5e or 6 Perform UTP Permanent link tests in accordance with TIA/EIA-568 (most current) standard.
3. Fiber Optic cable tests.
  - a. Perform an OTDR reel test and submit reports to the district representative before installation of the cable.
  - b. Perform a Certified bi-directional attenuation tests with a light source and power meter after installation is complete
4. Perform a bi-directional OTDR test on all fiber optic cables exceeding 90m in addition to the certified attenuation test.

E. Final Verification Tests

1. Perform verification tests for Category 5e, 6 and fiber optic cable systems after the complete structured cabling and workstation jacks are installed.
2. Provide District Representative with electronic and written final tests results within 10 days of completion of installation.
3. Final test results shall include summary pages for each IDF/MDF as required.
4. Test results shall be provided in both hard and soft copy.

END OF SECTION

section 27 50 00  
integrated communication system

PART 1 GENERAL

1.0 SCOPE OF WORK

- A. The work under this section includes all final design, all labor, material, equipment, supplies, labor, testing, and accessories required to modify the existing Rauland Telecenter ICS Integrated Communication System as indicated on the drawings and as specified herein.
- B. It is the intent of the Drawings and Specifications, which are presented in a "design-build" format, for the Contractor to modify and expand, design, provide and install a complete, fully operational, and tested system.
- C. All miscellaneous system components including, but not limited to, backboxes, cables, termination equipment, punch blocks, patch panels, painted backboards, and any other related items shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.

1.1 RELATED WORK

- A. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 16 of these specifications.
- B. All applicable portions of Section 26 00 00 shall apply to this section as though written herein completely.

1.2 GENERAL REQUIREMENTS

- A. The Contractor shall hold a valid State of California C-7 or C-10 license, shall have completed at least 20 projects of equal scope, shall have been in business of furnishing and installing systems of this scope and magnitude for at least five years, and capable of being bonded to assure the Owner of performance and satisfactory service during the guarantee period.
- B. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work.
- C. All work shall be performed under the supervision of a company accredited by the basic equipment manufacturer and such accreditation must be presented.
- D. The installing Contractor shall be a factory authorized distributor and warrantee station for the brand of equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The installing Contractor shall maintain a spare set of all major parts for the system at all times. All circuit boards, amplifiers and control sub systems shall be 100% backed up with stock at Contractors shop.

INTEGRATED COMMUNICATIONS SYSTEM

- E. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the installing Contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.
- F. All communication systems supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the Contractor's submittal.
- G. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment with the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment shall include any and all updated software revisions. In addition, when the software is available in disk format, a backup copy of the most up to date revision, in disk format, shall be handed to the Owner at the completion of the project.

### 1.3 QUALITY ASSURANCE

- A. In order to maintain a high degree of quality assurance, the Contractor shall, without exception, use the parts and supplies as specified in this specification.
- B. For any proposed substitution, a complete descriptive, technical and cost comparison, and test report package shall be submitted to the Owner for review five (5) working days prior to the bid date. Final approval of the substitution item shall be at the option of the Owner, and written notice of the status of the proposed alternative will be supplied to all bidders prior to the final bid date. The Owner or its representative must approve any proposed substitution item in writing. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by an independent testing consultant to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.
- C. It is the intent of these specifications to establish a standard of quality for labor and material to be installed. The Base Bid shall include materials as specified - without exception. Proposed substitutions, if approved in writing by the Owner, shall be listed on the bid form in addition to the specified materials.
- D. Approved equal status does not imply final acceptance. Final acceptance of a substitution item shall be made by the Owner prior to the award of bid to the successful Contractor, after reviewing the bid information.
- E. If a substitution item is given final acceptance by the Owner, the Contractor shall reimburse the Architect for any additional engineering charges and shall pay all charges of other trades resulting from the substitution, at no cost to the Owner.
- F. If a substitution item is given final acceptance by the Owner, the Contractor shall pay all charges (including travel, lodging, meals, etc...) required to provide factory certification, equal to that of a Factory Authorized Distributor of the substituted item, for two (2) selected Owners representatives. This training shall occur at the primary factory of the substituted item in question and shall allow the selected Owners representatives to provide any and all

### INTEGRATED COMMUNICATION SYSTEM

Factory/Manufacturer Approved repairs, services, software upgrades, etc. without affecting any available or applicable Manufacturer Warranties.

#### 1.4 SUBMITTAL AND MANUAL

- A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 16 of these specifications.
- B. Additional requirements of this section are:
  - 1. Within thirty (30) calendar days after the date of award of the Contract, the Contractor shall submit eight copies of the complete submission to the Architect for review.
  - 2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.
  - 3. The first section shall be the "index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.
  - 4. The second section shall include a copy of the Contractors valid C-10 California State Contractors license, a list of 20 projects of equal or greater scope, and a list of proposed instrumentation to be used by the Contractor. In addition, provide a written notice guarantying the provision of the requested warranty.
  - 5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.
  - 6. The fourth section shall contain an original factory data sheet for every component in the specifications.
  - 7. The fifth section shall contain a designation schedule for each Structured Cabling System location and complete 1/8" = 1'-0" scale drawing showing system wiring plans.
- C. Failure to comply with all of the requirements listed above will result in the rejection of the entire submittal package.
- D. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a wiring destination schedule for each circuit leaving for each piece of equipment; a schematic diagram of major components with all transistor and IC complements and replacement number.

#### 1.5 GENERAL SYSTEM PRODUCT, INSTALLATION AND OVERALL SYSTEM WARRANTY

- A. Prior to Owner acceptance, the Contractor shall provide to Owner, a manufacturers product and performance warranty. This will require a submittal of the required pre-job certification

registration forms as well as the required project closing information. The Owner will only acknowledge acceptance upon submittal of a valid manufacturer's warranty.

- B. The warranty shall commence from the date of final written acceptance by the Owner.
- C. All conditions for obtaining the manufacturers warranty shall be the sole responsibility of the Contractor.
- D. The Contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the Owner after the end of the guarantee period.
- E. A typewritten notice shall be posted at the equipment rack that shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.
- F. Installer / cable splicer certification – submit for approval 30 days before splices are to be made on cable. Certification shall include the training and experience of the individual on specific type and classification to be provided under this contract.

#### 1.6 SPECIFIC SYSTEM PRODUCT, INSTALLATION AND OVERALL SYSTEM WARRANTY

- A. The entire system shall be warranted free of mechanical or electrical defects for a period of one (1) year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the Owner.

#### 2.0 SYSTEM EQUIPMENT SPECIFICATION

- A. The system shall provide the state of the art in technology for all paging and intercom communications, secondary clock corrections, and bell schedules. The system is an existing Rauland Telecenter ICS.
- B. Modify and expand the existing Integrated Intercom/Communications System as required, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Contractor shall match existing brand and model of devices, components, and cabling on campus. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- C. Features offered by this system shall be implemented and controlled by software programs that can be changed and expanded as customer needs evolve.
- D. Amplified two-way voice communication shall be available from any dial phone in the system, through any speaker in the system. This shall allow hands-free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when speaker monitoring is active.

#### INTEGRATED COMMUNICATION SYSTEM

## 2.1 EQUIPMENT AND MATERIALS

### A. Public Address / Intercom / Clock Products

1. Classroom/Office combination speakers/clocks – Match existing type/model on campus.
2. Classroom Speaker/Clock back box – Match existing type/model on campus.
3. Classroom Speaker Wire – Match existing type/model on campus.
4. Hallway speakers – Match existing type/model on campus.
5. Exterior Speakers – Match existing type/model on campus.
6. All classroom/office/hallway speakers to be individually wired to a single port on ICS system.
7. Classroom speakers to be tapped at 1/2 watt, hallway 1/8 watt, offices 1/8 watt.
8. Tap exterior speakers per District instructions.
9. All student bathroom speakers to be grouped together on separate zones/circuits from the rest of the building. Do not combine with speakers in different buildings.
10. All outside speakers to be grouped together on separate zones/circuits. Do not combine with indoor or outdoor speakers.
11. Cross connection blocks shall be 66M-50 split-blocks mounted with 89B stand-off wall brackets.

## SECTION 3 – EXECUTION

### 3.0 GENERAL INSTALLATION REQUIREMENTS

- A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the Contractor shall notify the architect before making any changes. It shall be the responsibility of the factory-authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.
- B. Furnish all conduit, junction boxes, conductors, equipment plugs, terminal strips, etcetra, and labor to install a complete and operable system.
- C. The cables within the rack or cabinets shall be carefully cabled and ty-rapped. All cables shall be numbered for identification.
- D. Splices of conductors in pull boxes are not permitted.
- E. The labor employed by the Contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the Owner and architect to engage in the installation and service of this system.
- F. The Contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etcetra. The Contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The Contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc. caused by the performance of this work.
- G. The system must meet all local and other prevailing codes.

- H. All cabling installations shall be performed by qualified technicians.
- I. All cabling shall be splice free.
- J. Plenum rated cable may be run exposed above ceilings, provided the cabling is supported independent of other utilities such as conduits, pipes, and the ceiling support systems. The cables shall not be laid directly on the ceiling panels. The use of cable ties shall be done in accordance with the cable manufacturer's requirements. The cable jacket composition must meet local and all other prevailing fire and safety codes.
- K. All firewalls penetrated by structured cabling shall be sealed by use a non-permanent fire blanket or other method in compliance with the current edition of National Fire Protection Association (NFPA) and the National Electric Code (NEC) or other prevailing code. The Contractor must not use concrete or other non-removable substance for fire stopping on cable trays, wireways or conduits. Contractors who use this method will be required to replace all cables affected and provide the original specified access to each effected area.
- L. All exterior wire shall be rated for exterior use.
- M. The installer shall, upon completion of the system installation, adjust all controls, etc., to provide a system operating at maximum capability.
- N. Submit block diagram and shop drawing of equipment.
- O. Contractor to run cable from communications closet to phone room located at north end of Building A.
- P. Contractor to cross connect phone wiring from main cable feed to classrooms and offices with 22 awg yel/blu jumper wire.
- Q. Contractor to label 66M blocks feeding classrooms with extension number and room number.
- R. All exterior wire shall come through a dual ganged junction box located next to speaker.
- S. Wire clock correction from ICS system.
- T. Speaker/Clock combination boxes shall be flush mount.

### 3.1 GENERAL TESTING REQUIREMENTS

- A. Provide all instruments for testing and demonstrating in the presence of the Owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds.

### 3.2 SPECIFIC SYSTEM TESTING REQUIREMENTS

- A. Perform all manufactured required testing. Repair any defects and retest until all defects are repaired.

### 3.3 LABELING

- A. Cables shall be labeled with plastic coated machine-generated cable markers wrapped around cable in each terminal cabinet and junction box. Hand written labels are prohibited.
- B. Cables are to be labeled with Campus's designated Room Number (not the DSA or construction plan numbering). Labeling multiple cables to same room is to be numbered sequentially. Example: 409-1, 409-2, etc.
- C. Label all cable with Campus Room Number/Location. Cables shall be labeled with plastic coated cable markers wrapped around cable in each terminal cabinet and junction box.

## SECTION 4 - FINAL ACCEPTANCE

### 4.0 FINAL ACCEPTANCE

- A. The Owner or Owner's representative may visit the site during the installation of the system to ensure that correct installation practices are being followed.
- B. The Owner or Owner's representative will conduct a final job review once the Contractor has finished the job. This review will take place within one (1) week after the Contractor notifies the Owner of project completion.
- C. Two (2) copies of all certification data and drawings for all identifications shall be provided to the Owner before the Owner's review.
- D. The Owner or Owner's representative will review the installation and certification data prior to the system acceptance.
- E. The Owner or Owner's representative may test some of the systems features to ensure that the certification data is correct. If a substantial discrepancy is found, the Owner reserves the right to have an independent consultant perform a certification of the entire system. If such a procedure is undertaken, the cost of the testing will be billed back to the Contractor.
- F. In the event that repairs or adjustments are necessary, the Contractor shall make these repairs at his own expense. All repairs shall be completed within 10 days from the time they are discovered.
- G. The Contractor shall provide not less than eight (8) hours for site instruction of personnel in the operation and maintenance of the installed systems. This instruction time shall be divided as directed by the Owner.



- H. The Contractor shall hand to the Owner a copy of any applicable installation specific software configurations in disk format.

END OF SECTION

INTEGRATED COMMUNICATION SYSTEM

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PART 1 GENERAL

1.01 SCOPE & RELATED DOCUMENTS

- A. The work covered by this section of the specifications include the furnishing of all labor, equipment, materials and performance of all operations associated with the installation of the Fire Alarm Systems as outlined. All items required to complete the installation whether detailed here in the specification or on the drawings shall be included in this contract.
- B. The requirements of the conditions of the Contract, Supplementary Conditions, and General Requirements apply to the work specified in this section.
- C. Related work in other sections or divisions:
  - 1. Waterflow switches.
  - 2. Sprinkler valve supervisory switches.
  - 3. HVAC Systems Controls.
  - 4. Elevator monitor/control panel.
  - 5. Electrical (Section 16000).
- D. The entire installation, including materials and equipment shall meet or exceed the minimum standards and requirements of the following:

California State Fire Marshall Listed Components

2016 California Building Code

2016 California Fire Code

2016 California Mechanical Code

2 NFPA 72 – 2016 National Fire Alarm Code®, As amended by CA code

NFPA 90 - Air-Conditioning and Ventilating Systems

NFPA 92A - 2012 Smoke Control Systems

UL listing for fire smoke control (UUKL)

Americans with Disabilities Act (ADA)

013 California Electrical Code

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS) California State Fire

- A. The plans for this project have already been approved by DSA-FLS. The Contractor shall prepare eight (8) sets of blue-line drawings, eight (8) sets of submittal booklets, for submittal to the Engineer for approval.

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B. The following shall be included on all drawings:

1. Building floor plan of each building drawn to 1/8" scale minimum. Building floor plan shall show location of all devices, conduit and interconnecting wires. Device symbols shall be the same as on the original bid set of drawings. Show all fire rated corridors, occupancy separations and area separation walls. Show all Room Identification Numbers/Use.
2. Site plan showing all buildings, conduit and interconnecting wires.
3. Complete symbol legend (same symbols as bid set), showing all symbols, wire, manufacturer, model number, back-box, mounting height and CSFM Listing Number.
4. Typical mounting height details.
5. Voltage drop using point to point or OHMS Law calculations. Voltage drop shall not exceed 10% per circuit.
6. Battery calculations with batteries used:  
Normal - 100% for applicable equipment and devices for a period of 24 Hours.  
Alarm - 100% for applicable equipment and devices for a period of 5 Minutes.
7. Codes as used in the design of this project.
8. DSA Application Number and District File Number.
9. Classification per building. Ex: Manual, Automatic, etc.
10. Typical fire penetration detail showing methods and codes used.
11. Wiring riser diagram including but not limited to, devices, wiring, zoning, EOL'S, etc.
12. Sequence of operations schedule.
13. General notes pertaining to this project.

C. The following shall be included in the submittal book:

1. Cover Sheet: Project Name, Project Location, Architect/Engineer of record, System Supplier/System Installer with C-10 License Number, UL Listing Number with Expiration Dates.
2. Table of Contents: Page numbers of all specification sheets and CSFM Listing Numbers.
3. Specification Sheets for each piece of equipment.
4. CSFM Listing Sheets.

1.03 EQUIPMENT QUALIFICATION

- A. The specification is based upon equipment as manufactured by Edwards Systems Technology – EST as approved by the District. The equipment specified is a District Standard (per Public Contract Code 3400). The system supplied shall be a microprocessor-based direct wired, multi-priority peer-to-peer networked system. The system shall utilize independently addressed, microprocessor-based EST Fire Alarm Detectors, Devices and Modules as described in this specification. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation.

INTEGRATED FIRE ALARM SYSTEM

- B. All equipment shall conform to all applicable codes and ordinances, and shall be listed by Underwriters Laboratories and the California State Fire Marshall.

#### 1.04 QUALIFICATION OF BIDDERS

- A. To qualify as an acceptable bidder, whether the bid is submitted to the Owner, his agent, a general contractor or a sub-contractor, the system bidder or contractor shall be a qualified U.L. Listed Fire Alarm contractor (at time of bid) and shall hold a valid C-10 License issued by the Contractors State License Board of California. The system bidder or installing contractor shall herein be referred to as the Contractor. The Contractor shall also hold a State of California Consumer Affairs License - Bureau of Collection and Investigative Services. The Contractor shall also have on staff, a minimum of Three Nicet Certified Technologists (at time of bid). This is to insure that licensed installers familiar with this type of installation will be used on this project. The Contractor shall be the factory authorized distributor (at time of bid), for the brand of equipment being installed. The Contractor shall have been in the business of supplying, installing and servicing Addressable Fire Alarm Systems for the past 15 years, in the State of California. The Contractor shall be able to refer to at least 20 projects of this nature rendering satisfactory service with contact persons, phone numbers and addresses. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall maintain an inventory of all major components in stock at all times. The Contractor's Office shall be located within 40 miles of the job-site. This will insure an adequate service response, in a timely matter. The Contractor shall maintain on staff for the duration of the project a minimum of four EST-3 Certified Installers. Contractors not pre-approved in writing 21 days prior to bid hour and date will not be considered for this project. Contractors named in 1.03C above, are considered to be pre-approved for this project, and will be able to satisfy warranties already in place.
- B. The responsibility of the installing Contractor is to provide all drawings, submittals, wire, devices, equipment, installation to conduit system furnished and installed under Section 26 0000, programming, final test out and certification. All specialty Fire Alarm Back-boxes for the conduit system installation provided under Section 16000, shall be provided under this section. Terminal cabinets, pull boxes, etc. shall be furnished and installed under section 26 0000.

### PART 2 SYSTEM LAYOUT

#### 2.01 SYSTEM DESCRIPTION

- A. The Fire Alarm System as outlined on the drawings, shall be a Fire Life Safety System as manufactured by Edwards. It shall be complete with all necessary hardware, software and memory specifically tailored for this project.
- B. Provide a new Network System, Remote Panels, Remote Annunciators, Printers, Devices, etc. in accordance with specifications and drawings. Counts for devices to be in accordance with engineers drawings.

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- C. All equipment needed for a complete operable system, (whether specifically indicated or not) shall be included in this section. It shall be the Installing Contractors responsibility for a COMPLETE AND OPERABLE SYSTEM upon completion of this project.

## 2.02 AUTOMATIC ALARM OPERATIONS

- A. The fire alarm system operation subsequent to the alarm initiation via pull station, smoke detector, heat detector, sprinkler flow switch, etc., shall be as follows:
  - 1. All audible alarm indicating devices shall sound the Temporal Signal Code in synchronization with each other, until silenced at the control panel or at the remote annunciator.
  - 2. All visual alarm indicating devices shall flash per NFPA requirements in synchronization with each other, until reset at the control panel or at the remote annunciator.
  - 3. Alarm audible devices and alarm visual devices shall operate on the same circuit.
  - 4. The alarm signals shall be inhibited from being silenced for a period of at least 1 minute after commencing operation. This rate is to be field programmable for actual AHJ requirements.
  - 5. Display type and location of alarm per point on the Main Control Panel LCD display.
  - 6. Display type and location of alarm per point on Remote LCD Annunciator.
  - 7. List on printer the time, date, type and user defined message for each event printed.
  - 8. Graphically display on the Fire Works Station, school diagram showing whole school, with graphic scrolling thru system prompts, down to point of alarm activation.
  - 9. Subsequent alarms are to report to the Main Control Panel and Fire Works, shall indicate to the operator that a subsequent alarm is present, and also indicate the number of subsequent alarms.
  - 10. Shut down all associated air handlers in Alarm Zone.
  - 11. De-energize door holders to release fire doors in Alarm Zone.
  - 12. Recall elevators as required.

## 2.03 AUTOMATIC SUPERVISORY OPERATION

- A. All data, initiating, indicating and supervisory lines shall be constantly monitored for integrity. Indicate opens, shorts, grounds, at Main Control Panel, Remote Annunciator and Fireworks Station.

## 2.04 OPERATION

- A. During the normal state, the NORMAL LED (green) shall flash. The first line of the LCD shall display the time in (HH:MM:SS) as well as the number of active points (AP) and the number of disabled points (DP) in the system.
- B. When the control panel goes into alarm condition, the NORMAL LED (green) extinguishes and the

# INTEGRATED FIRE ALARM SYSTEM

ALARM LED (red) shall light, the buzzer pulsates and the LCD indicates the time, the number of messages waiting, the type of alarm, the point ID number of device, and the time that the alarm occurred. The second line is dedicated to the user specified message.

- C. To silence the panel buzzer, the operator shall press the LOCAL SILENCE button and the buzzer will silence.
- D. To silence the audible devices, the operator shall press the ALARM SILENCE button. A new alarm shall cause the audibles to resound.
- E. During the TROUBLE condition, the amber TROUBLE LED shall light, the NORMAL LED shall go out, and the buzzer shall pulsate. The display shall indicate the point ID number of the device, the time the event occurred and up to a 40 character custom user description.
- F. During the MONITOR or SUPERVISORY condition, the appropriate LED shall light, the NORMAL LED shall go out, and the buzzer shall pulsate. The display shall indicate the point ID number of the device, the time the event occurred and up to a 40 character custom user description.

### PART 3 MATERIALS

#### 3.01 MAIN or REMOTE CONTROL PANEL EST-3 W/CAB7/CAB14/CAB21

- A. Control Panel construction shall be modular with solid state, micro - processor based electronics. It shall display only those primary controls and displays essential to operation during an alarm condition.
- B. A local audible device shall sound during Alarm, Trouble, Monitor or Supervisory conditions. This audible device shall sound differently at each condition, to distinguish one condition from another without having to view the panel.
- C. Primary Keys, LED's, LCD Display
  - 1. The following primary controls shall be visible through a front access panel:
    - 8 Line by 21 Character LCD display
    - Individual System ALARM LED and Switch
    - Individual SUPERVISORY LED and Switch
    - Individual TROUBLE LED and Switch
    - Individual MONITOR LED and Switch
    - Individual RESET LED and Switch
    - Individual ALARM SILENCE LED and Switch
    - Individual PANEL SILENCE LED and Switch
    - Individual DRILL LED and Switch
    - Individual LED'S For Power, Test, CPU Fail, Gnd Fault, Disable

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#### NEXT/BACK Switch Per Condition

- D. The Master Controller shall be capable of supporting up to 64 supervised system nodes per single line network without any change in hardware. Each controller shall contain a RS-232 Printer /Programming Port for programming locally via an IBM PC.
- E. Each controller shall support up to 10 Intelligent Loop Cards (SDCs). Each card shall support (125) Intelligent Sensors and (125) Intelligent Modules. Each sensor shall respond to a panel poll for information with an analog representation of measured fire related phenomena (smoke density, particles of combustion, temperature). Such response proves end to end sensor response including the operation of the sensor electronics. Systems which only monitor the presence of a conventional detector in an addressable base shall not be acceptable.
- F. The Master Controller shall have the following additional features without any changes in hardware or firmware:
  - 1. Auto Programming and Electronic Addressing of Field Devices.
  - 2. Logic Statements.
  - 3. Time Controls.
  - 4. Sequences.
  - 5. Actions.
  - 6. Analog Value Reporting of all analog sensors and traditional zones.
  - 7. Maintenance Reporting by Intelligent Sensor.
  - 8. Sensitivity Setting by Sensor (Within UL Limits).
  - 9. Sensitivity Setting changed by time (Day/Night Mode).
  - 10. Alarm Verification by point or zone. (0-60 Seconds).
  - 11. Print a history of Sensors Activating the Verification Cycle.
  - 12. On demand system condition printouts (status).
  - 13. Enabling and Disabling of any system device or function.
  - 14. Ground Fault Detection by Panel, by Signature Data Circuit, and by Device Module.
  - 15. Normal and Silent One Man Test.
  - 16. Windows Based Programming.
  - 17. Network Response Time Under 3 Seconds.
  - 18. Loop Response Time Under 750 Milliseconds.
  - 19. Device Mapping Feature for As-Builts.
  - 20. Up to 1750 History Events

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21. Remote Systems Diagnostic via Phone Line

3.02 REMOTE ANNUNCIATOR - 3- LCDANN

- A. Remote Annunciator to accommodate all buildings for the Fire Alarm System. Annunciator zoning shall have the following displays as a minimum:
  - 1. Point ID number of each device.
  - 2. Custom annunciation of each device.
  - 3. Common Controls Features.
- B. The remote annunciator shall contain the following:
  - 1. 8 Line by 21 Character LCD Display.
  - 2. Individual System ALARM LED and Switch.
  - 3. Individual SUPERVISORY LED and Switch.
  - 4. Individual TROUBLE LED and Switch.
  - 5. Individual MONITOR LED and Switch.
  - 6. Individual RESET LED and Switch.
  - 7. Individual ALARM LED and Switch.
  - 8. Individual TROUBLE LED and Switch.
  - 9. Individual DRILL LED and Switch.

3.03 VOICE NOTIFICATION CIRCUITS

- A. Individual LED'S For Power, Test, CPU Voice Notification Circuits Fail, Gnd Fault, Disable. Voice Notification Circuits:
  - 1. 3-ZA40B Zoned Audio Amplifier
    - a. Includes one (1) speaker circuit, wired as Style Y (Class B) or Style Z (Class A)
    - b. Produces 40 watts of digital power @ 70.7 VRMS
    - c. Operating Voltage 27.3 to 20.4 VDC
    - d. Alarm Current 2.48 amp max. at 40 Watts.
- B. Audio Amplifier (3-ZA40B): Include as a minimum, the following features:
  - 1. Selectable 70VRMS or 25VRMS speaker circuit output.
  - 2. Power for the amplifier comes from the standard system power supply through the local rail.
  - 3. Amplifier comes standard with one 24 VDC power limited Notification Appliance Circuit.
  - 4. Back-up 1000HZ temporal generator.
  - 5. Ability to deliver up to 8 different signals simultaneously.
- C. Voice Notification Circuits:



1. 3-ZA95 Zoned Audio Amplifier

- a. Includes one (1) speaker circuit, wired as Style Y (Class B) or Style Z (Class A)
- b. Produces 95 watts of digital power @ 70.7 VRMS
- c. Operating Voltage 27.3 to 20.4 VDC
- d. Alarm Current 5.54 amp max. at 95 Watts.

D. Audio Amplifier (3-ZA40B): Include as a minimum, the following features:

- 1. Selectable 70VRMS or 25VRMS speaker circuit output.
- 2. Power for the amplifier comes from the standard system power supply through the local rail.
- 3. Amplifier comes standard with one 24 VDC power limited Notification Appliance Circuit.
- 4. Back-up 1000HZ temporal generator.
- 5. Ability to deliver up to 8 different signals simultaneously.

E. Voice Options:

- 1. Fire Fighter Telephone Handset (requires EST3 Lobby Enclosure): 3-ASU/FT

3.04 PRINTER - PT-1S

- A. Provide printer for the life safety system, if indicated.
- B. The event and status printer shall be a 9 pin, impact, dot matrix printer with a minimum print speed of 232 characters per second. Printer parameters shall be set up with a menu drive program in the printer. The printer shall be capable of serial or parallel communications protocol.
- C. The communications speed for RS-232 communications protocol shall be adjustable from 300 - 9600 Baud. The serial cable shall be supervised.
- D. The printer shall list the time, date, type and user defined message for each event printed.

3.05 SIGNATURE SERIES DEVICES - GENERAL

- A. Each remote device shall have a microprocessor with non-volatile memory to support its function and serviceability. Each device shall store as required for its functionality the following data:  
  
device serial number, device address, device type, personality code, date of manufacture, hours

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in use, number of alarms and troubles, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.

- B. Dependent on its functionality, each device shall be capable of monitoring up to 32 diagnostics codes. This data shall be stored at the device and available for system maintenance.
- C. Each device shall be capable of performing its intended function dependent of the control panel, to lower loop data traffic. Each device shall immediately alert the loop controller of a status change to achieve a loop response time of less than 750ms.
- D. Each device shall be capable of electronic addressing, either automatically or application program designed, to support physical/electrical mapping and supervision by location. Setting a device's address by physical means shall not be necessary. Each device shall be individually annunciated at the Main Control Panel and Remote Annunciator.

### 3.06 ANALOG PULL STATIONS - SIGA-278

- A. Provide pull stations as indicated on the drawings.
- B. Pull station shall be double action with terminals for field wiring. Pull station shall be constructed of Red Lexan with White Letters, Key resettable with break glass rod.
- C. Station shall be equipped with a STI 1100 Protective Cover w/horn, if indicated on drawings.
- D. For flush mounting applications - Use 4S 2-1/8" box with 1/2" Single Gang Ring. (Furnished and Installed under Section 16000).
- E. For surface mounting applications - Use 276B-RSB Back box With STI-3100 Conduit Spacer. (Furnished under this section, Installed under Section 16000).

### 3.07 ANALOG COMBINATION SMOKE DETECTORS – SIGA2-PHS W/SIGA-SB BASE

- A. Provide Intelligent Combination Photoelectric Smoke Detector AND Heat Detectors where indicated on the drawings. The analog detector shall utilize a light scattering type photoelectric

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smoke detector to sense changes in air samples from its surroundings. The Heat Detector shall have low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air to process an alarm.

- B. Each unit shall incorporate a field replaceable smoke chamber.
- C. Each sensing element self-compensates for changes in the detectors installed environment to maintain the sensitivity setting and prevent unwanted alarms. The detector reports when it cannot compensate any further.
- D. Units shall incorporate twin status LED's . Flashing green shows normal; flashing red shows alarm state; steady red and steady green show alarm state in stand alone mode, visible from any direction.
- E. Units shall incorporate a stand alone operation mode. The detector makes decisions and inputs an alarm even if the loop controller fails. The detector reverts to an intelligent "conventional" detector when polling interrogation stops.
- F. Units shall mount to the SIGA-SB, SIGA-RB or SIGA-IB bases as required.
- G. Base shall mount to a 4S 2-1/8" box with 3-0 1/2" ring. (Furnished and Installed under Section 16000).

### 3.08 DUCT SMOKE DETECTORS - SIGA-SD (SUPER DUCT W/INTELLIGENT SENSOR)

- A. Provide Duct Smoke Detectors where indicated on the drawings.
- B. Duct Housing shall be constructed of a plastic housing. Units shall incorporate the SIGA-PS sensor, base as required and sampling tubes as required for duct width.
- C. Each air handling unit shall be controlled from the built in relay, for shut down of that particular unit.
- D. Duct Housings, Detectors, and Sampling Tubes are to be supplied by this section.
- E. Duct Housings and Sampling Tubes are to be installed as part of the conduit system in Section 16000. Section 16000 Contractor to provide and install weatherproof housings for above, if applicable to this project.

### 3.09 HEAT DETECTORS – SIGA2-HRS W/SIGA-SB BASE

- A. Provide Heat Sensors where indicated on the drawings.
- B. Detectors shall gather analog information from their fixed temperature and/or rate-of-rise heat sensing elements and convert it into digital signals. The detectors on board microprocessor measures and analyzes these signals. It compares the information to historical readings and time patterns to make an alarm decision. Digital filters remove signal patterns that are not typical of fires.

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- C. Units shall incorporate twin status LED's. Flashing green shows normal; flashing red shows alarm state; steady red and steady green show alarm state in stand alone mode, visible from any direction.
- D. Units shall mount to the SIGA-SB, SIGA-RB or SIGA-IB bases as required.
- E. Base shall mount to a 4S 2-1/8" box with 3-0 Ring. (Furnished and Installed under Section 16000).

### 3.10 ATTIC HEAT DETECTORS - 284B-PL W/SIGA-CT1

- A. Provide Heat Detectors where indicated on the drawings.
- B. Units shall incorporate single pole, normally open contacts and a SIGA-CT1 Monitor Module.
- C. Fixed Temperature Rating shall be 194 Degrees Farenheit.
- D. Units shall mount to a 4S 2-1/8" box with 3-0 Ring (Furnished and Installed under Section 16000).
- E. Monitor modules shall mount to a 4-S 2-1/8" box with 1-Gang Ring (Furnished and Installed under Section 16000).

### 3.11 STROBES – GENESIS G1RF-VM (Wall)

- A. Provide Strobes as indicated on the drawings.
- B. Strobes shall be Multi Candela rated 15cd, 30cd, 75cd or 110cd. Strobes shall be capable of being on same circuit as audibles, be synchronized and flash per NFPA requirements. Units not capable of this feature shall install separate audible and visual circuits, conductors, synchronization modules, etc. All additional costs to be borne by contractor. Strobes shall be listed for indoor applications. Units shall be rated for 24VDC polarized operation.
- C. For flush mount applications - Use 4S 2-1/8" boxes with 1 Gang Ring. (Furnished and Installed under Section 16000).
- D. For surface mount applications - Use One Gang Wiremold Box V5748 (Furnished and installed under Section 16000).

### 3.12 STROBES – GENESIS GCF-VM (Ceiling)

- A. Provide Strobes as indicated on the drawings.
- B. Strobes shall be Multi Candela rated 15cd, 30cd, 75cd or 95cd. Strobes shall be capable of being on same circuit as audibles, be synchronized and flash per NFPA requirements. Units not capable of this feature shall install separate audible and visual circuits, conductors, synchronization modules, etc. All additional costs to be borne by contractor. Strobes shall be listed for indoor applications. Units shall be rated for 24VDC polarized operation.
- C. For flush mount applications - Use 4S 2-1/8" boxes with 4-S Extensions Ring. (Furnished and Installed under Section 16000).

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- D. For surface mount applications - Use Wiremold Box V5753 (Furnished and installed under Section 16000).

### 3.13 HORN/STROBES – GCF-VM (Ceiling)

- A. Provide Horn/Strobes as indicated on the drawings.
- B. HORN/(Strobes) to be rated at 92.4dBA - low and 96.6BA - high. Units shall incorporate a high and low horn setting position. (Horn)/STROBE to be Multi Candela Rated at 15cd, 30cd, 75cd or 95cd. Units shall have screw terminals for input/output wiring and be suitable for indoor applications. Units shall be capable of being installed on the same indicating circuit. Units shall sound the Temporal Code in synchronization and strobes shall flash in synchronization per NFPA requirements. Units not capable of this feature shall install separate audible and visual circuits, conductors, synchronization modules, etc. All additional costs to be borne by contractor. Units to rated for 24VDC polarized operation.
- C. For flush mount applications - Use 4S 2-1/8" boxes with 4-S Extension Ring (Furnished and Installed under Section 16000).
- D. For surface mount applications - Use Wiremold Box V5753 (Furnished under this section, Installed under Section 16000).

### 3.14 SPEAKER/STROBE – G4RF-S7VM

- A. Provide Speaker/Strobe as indicated on the drawings.
- B. The speaker shall include both 25 and 70 Volt VRMS models with field selectable power taps from 1/4 to 2 watt with listed sound output up to 90 dB.
- C. The speaker audio inputs include a blocking capacitor for DC supervision.
- D. The speaker has sealed back construction for extra protection and improved audibility.
- E. The strobe shall have selectable 15, 30, 75 or 110 CD settings.
- F. It shall be possible to change the strobe setting without removing the device from the wall.
- G. It shall be a low profile design, finished in red. In-out screw terminals shall be provided for wiring.
- H. It shall be suitable for wall mounting and shall mount semi flush in a standard North American 4"square electrical box, 2 1/8" deep. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

### 3.15 CEILING SPEAKER/STROBE – GCFR-S7VM

- A. Provide Speaker/Strobe as indicated on the drawings.
- B. The speaker shall include both 25 and 70 Volt VRMS models with field selectable power taps from 1/4 to 2 watt with listed sound output up to 90 dB.
- C. The speaker audio inputs include a 10uf blocking capacitor for DC supervision.

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- D. The speaker has sealed back construction for extra protection and improved audibility.
- E. The strobe shall have selectable 15, 30, 75 or 95 cd settings.
- F. It shall be possible to change the strobe setting without removing the device from the ceiling.
- G. It shall be a low profile design, finished in red. In-out screw terminals shall be provided for wiring.
- H. It shall be suitable for wall mounting and shall mount semi flush in a standard North American 4'square electrical box, 2 1/8" deep. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

#### 3.16 WEATHERPROOF SPEAKER – WG4RN-S

- A. Provide weatherproof Speakers as indicated on drawings.
- B. The speaker shall include both 25 and 70 Volt VRMS models with field selectable power taps from 1/4 to 2 watt with listed sound output up to 90 dB.
- C. The speaker audio inputs include a blocking capacitor for DC supervision.
- D. The speaker has sealed back construction for extra protection and improved audibility.
- E. It shall be a low profile design, finished in red. In-out screw terminals shall be provided for wiring.
- F. It shall be suitable for wall mounting and shall mount semi flush in a standard North American 4"square electrical box, 2 1/8" deep. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

#### 3.19 WEATHERPROOF LOUD-SPEAKER, RE-ENTRANT MILLENNIUM CLASS #5552-15W-R

- A. Provide weatherproof Loud-Speakers as indicated on drawings.
- B. The speaker shall include both 25 and 70 Volt VRMS with power taps at 1, 2, 3, 8, 7.5 & 15 watt with listed sound output up to 120 dB.
- C. The speaker audio inputs include a blocking capacitor for DC supervision.
- D. The speaker has sealed back construction for extra protection and improved audibility.
- E. It shall be a low profile design, finished in red. In-out screw terminals shall be provided for wiring.
- F. It shall be suitable for exterior box mounting and shall mount with 1/2" conduit entrance..

#### 3.19 MODULES - SIGA-CC1S/SIGA-CT1/SIGA-CT2/SIGA-CR/SIGA-MM1/SIGA-WTM

- A. Speaker/Strobe, Genesis G4 Series G4RF-S7VM , CSFM 7320-1657:0211
  - 1. The speaker shall include both 25 and 70 Volt VRMS models with field selectable power taps from 1/4 to 2 watt with listed sound output up to 90 dB.
  - 2. The speaker audio inputs include a blocking capacitor for DC supervision.

3. The speaker has sealed back construction for extra protection and improved audibility.
  4. The strobe shall have selectable 15, 30, 75 or 110 CD settings.
  5. It shall be possible to change the strobe setting without removing the device from the wall.
  6. It shall be a low profile design, finished in red. In-out screw terminals shall be provided for wiring.
  7. It shall be suitable for wall mounting and shall mount semi flush in a standard North American 4"square electrical box, 2 1/8" deep. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.
- B. Provide modules as indicated on the drawings.
  - C. Units shall permanently store serial number, type of device, and job number. Each module shall be capable of having its own personality code. Use respected module for particular application. Modules shall use electronic addressing. Use of switches to set address will be prohibited.
  - D. Module for flush or surface mountings - Use 4S 2-1/8" Boxes One or Two Gang Ring as required, (Furnished and Installed under Section 16000).

#### PART 4 EXECUTION

##### 4.01 INSTALLATION

- A. Wiring shall be installed in conduit as specified under the electrical section of the specification (Section 26000).
- B. The sum of the cross-sectional areas of individual conductors shall not exceed 40% of the interior cross sectional area of the conduit. Minimum conduit size shall be 3/4 inch trade size.
- C. Wiring shall be identified at terminal and junction locations to prevent unintentional interference with the circuits during testing and servicing.
- D. Junction, pull and terminal boxes/cabinets shall be labeled. Labels shall be permanently affixed to covers/doors. Labeling to be Furnished and Installed under Section 16000.
- E. Wiring color code shall be consistent throughout the system and shall allow for easy identification of initiating, indicating and auxiliary control circuits.
- F. Wiring at building terminal cabinets shall be terminated to screw barrier strips, with circuits identified.
- G. Wiring in control, terminal and junction cabinets shall be neatly arranged and bundled.
- H. Wiring shall test free of earth grounds or shorts between conductors.
- I. The contractor shall be responsible and assure the use of adequate numbers of skilled workmen, who are thoroughly trained and experienced, and completely familiar with the specified equipment and code requirements.

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- J. The contractor shall be responsible for assuring that conduit size, wire type and color coding meets the specification, manufacturers and code requirements.

#### 4.02 SYSTEM VERIFICATION

- A. Upon completion of the installation, the fire alarm contractor shall place into operation and test all operational features, functions and devices.
- B. Upon completion of testing, and after the system has been in operation for a minimum of 5 days without failure, the fire alarm contractor shall schedule with the Authority Having Jurisdiction (DSA INSPECTOR), Architect and Engineer, a demonstration and field acceptance test.
- C. Field acceptance and approval of the fire alarm system shall be evidenced in writing by the Authority Having Jurisdiction.
- D. Prior to scheduling field acceptance, the fire alarm system contractor shall certify in writing, and record the method of testing, the results of all tests and certify that the system has been in operation a minimum of 5 days.
- E. All testing shall be conducted in accordance with NFPA-72, contract documents, manufacturer's instructions and per the requirements of the Authority Having Jurisdiction.

#### 4.03 GUARANTEE AND SERVICE

- A. Fire alarm system contractor shall provide written guarantees for all fire alarm equipment and devices used on this project for a period of THREE (3) YEARS from the date of final acceptance.
- B. During the guarantee period the contractor shall repair or replace any defective material at no additional cost to the Owner.

#### 4.04 IN SERVICE TRAINING

- A. The fire alarm contractor shall provide factory trained representatives to demonstrate the operation of the fire alarm system to the Owner's personnel. The representative shall have a thorough knowledge of the equipment and operation of the system. The contractor shall provide one (1) 4 hour in-service training session.
- B. The fire alarm contractor shall provide to the Authority Having Jurisdiction a demonstration of system operation. Session shall consist of one (1) 4 hour in-service training.

#### 4.05 OPERATION MAINTENANCE MANUALS

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- A. The fire alarm contractor shall provide to the Engineer, three (3) weeks after the field acceptance test, two (2) sets of operating/maintenance manuals and one (1) set of as-built drawings.
- B. As-built drawings shall indicate the location of all devices, appliances, coding, zoning, wiring sequences, wiring methods, color coding, identification, labeling and connections of the components of the fire alarm system as installed. The as-builts shall include a mapping sequence as generated by the Fire Alarm Control Panel and connected computer. Systems not capable of this feature shall generate TRUE Device mapping sequences as-builts on Auto Cad 2014. These as-builts shall show the physical layout of all addressable devices as they were actually installed on the loop.

END OF SECTION

INTEGRATED FIRE ALARM SYSTEM

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section 28 16 00  
intrusion alarm system

SECTION 1 - GENERAL

1.0 SCOPE OF WORK

- A. The work under this section includes all final design, all labor, material, equipment, supplies, labor, testing, and accessories required to modify and expand the existing campus DSC Intrusion Alarm System as indicated on the drawings and as specified herein.
- B. It is the intent of the Drawings and Specifications, which are presented in a "design-build" format, for the Contractor to design, provide and install a complete, fully operational, and tested system.
- C. All miscellaneous system components including, but not limited to, cables, termination equipment, punch blocks, patch panels, backboards, and any other related items shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.
- D. The Intrusion Alarm System shall include, but not limited to, the following subsystems / products:
  - 1. See Products Section.

1.1 RELATED WORK

- A. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 16 of these specifications.
- B. All applicable portions of Section 26 10 00 shall apply to this section as though written herein completely.

1.2 GENERAL REQUIREMENTS

- A. The Contractor shall hold a valid State of California C-7 Low-Voltage License, and a Department of Consumer Affairs Bureau of Security and Investigative Services (BSIS) "Alarm Company Operator's" License; shall have completed at least 20 projects of equal scope; shall have been in business of furnishing and installing systems of this scope and magnitude for at least five (5) years; and is capable of being bonded to assure the Owner of performance and satisfactory service during the guarantee period.
- B. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work.

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- C. All work shall be performed under the supervision of a company accredited by the basic equipment manufacturer and such accreditation must be presented with the Contractor's bid submittal.
- D. The installing Contractor shall be a factory authorized distributor and warrantee station for the brand of equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The installing Contractor shall maintain a spare set of all major parts for the system at all times. All circuit boards, amplifiers and control sub systems shall be 100% backed up with stock at Contractors shop.
- E. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the installing Contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.
- F. All system equipment/systems supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the Contractor's submittal.
- G. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment with the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment shall include any and all updated software revisions. In addition, when the software is available in disk format, a backup copy of the most up to date revision, in disk format, shall be handed to the Owner at the completion of the project.
- H. The Contractor shall pay all charges (including travel, lodging, meals, etc.) required to provide factory certification, equal to that of a Factory Authorized Distributor of the substituted item, for two (2) selected Owner's representatives. This training shall occur at the primary factory of the substituted item in question and shall allow the selected Owners representatives to provide any and all Factory / Manufacturer Approved repairs, services, software upgrades, etcetera, without affecting any available or applicable Manufacturer Warranties.

### 1.3 QUALITY ASSURANCE

- A. In order to maintain a high degree of quality assurance, the Contractor shall, without exception, use the parts and supplies as specified in this specification.
- B. For any proposed substitution, a complete descriptive, technical and cost comparison, and test report package shall be submitted to the Owner for review five (5) working days prior to the bid date. Final approval of the substitution item shall be at the option of the Owner, and written notice of the status of the proposed alternative will be supplied to all bidders prior to the final bid date. The Owner or its representative must approve any proposed substitution item in writing. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by an independent testing consultant to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.

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- C. It is the intent of these specifications to establish a standard of quality for labor and material to be installed. The Base Bid shall include materials as specified - without exception. Proposed substitutions, if approved in writing by the Owner, shall be listed on the bid form in addition to the specified materials.
- D. Approved equal status does not imply final acceptance. Final acceptance of a substitution item shall be made by the Owner prior to the award of bid to the successful Contractor, after reviewing the bid information.
- E. If a substitution item is given final acceptance by the Owner, the Contractor shall reimburse the Architect for any additional engineering charges and shall pay all charges of other trades resulting from the substitution, at no cost to the Owner.
- F. If a substitution item is given final acceptance by the Owner, the Contractor shall pay all charges (including travel, lodging, meals, etcetera) required to provide factory certification, equal to that of a Factory Authorized Distributor of the substituted item, for two (2) selected Owners representatives. This training shall occur at the primary factory of the substituted item in question and shall allow the selected Owners representatives to provide any and all Factory / Manufacturer Approved repairs, services, software upgrades, etcetera without affecting any available or applicable Manufacturer Warranties.

#### 1.4 SUBMITTAL AND MANUAL

- A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 16 of these specifications.
- B. Additional requirements of this section are:
  - 1. Within thirty (30) calendar days after the date of award of the Contract, the Contractor shall submit eight copies of the complete submission to the Architect for review.
  - 2. The submission shall consist of five (5) major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.
  - 3. The first section shall be the "index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.
  - 4. The second section shall include a copy of the Contractor's valid C-7 California State Contractors license, and a list of twenty (20) projects of equal or greater scope, and a list of proposed instrumentation to be used by the Contractor. In addition, provide a written notice guarantying the provision of the requested warranty.
  - 5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.

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6. The fourth section shall contain an original factory data sheet for every component in the specifications.
  7. The fifth section shall contain a designation schedule for each Structured Cabling System location and complete 1/8" = 1'-0" scale drawing showing system wiring plans.
- C. Failure to comply with all of the requirements listed above will result in the rejection of the entire submittal package.
  - D. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a wiring destination schedule for each circuit leaving for each piece of equipment; a schematic diagram of major components with all transistor and IC complements and replacement number.
- 1.5 GENERAL SYSTEM PRODUCT, INSTALLATION AND OVERALL SYSTEM WARRANTY
- A. Prior to Owner acceptance, the Contractor shall provide to Owner, a manufacturer's product and performance warranty. This will require a submittal of the required pre-job certification registration forms as well as the required project closing information. The Owner will only acknowledge acceptance upon submittal of a valid manufacturer's warranty.
  - B. The warranty shall commence from the date of final written acceptance by the Owner.
  - C. All conditions for obtaining the manufacturer's warranty shall be the sole responsibility of the Contractor.
  - D. The Contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the Owner after the end of the guarantee period.
  - E. A typewritten notice shall be posted at the equipment rack that shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.
  - F. The entire system shall be warranted free of mechanical or electrical defects for a period of one (1) year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the Owner.

#### 1.6 APPLICABLE CODES AND STANDARDS

- A. 2016 California Administrative Code (CAC), Part 1, Title 24 C.C.R.
- B. 2016 California Building Code (CBC), Part 2, Title 24 C.C.R.;  
(2015 International Building Code Vol. 1 & 2, and 2016 California Amendments).
- C. 2016 California Electrical Code (CEC), Part 3, Title 24 C.C.R.;  
(2014 National Electrical Code and 2016 California Amendments)

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- D. 2016 California Fire Code (CFC), Part 9, Title 24, C.C.R.;  
(2015 International Fire Code and 2016 California Amendments)
- E. 2016 California Referenced Standards Code, Part 12, Title 24, C.C.R.  
Title 19 C.C.R., Public Safety, State Fire Marshall Regulations.

## PART 2 - SYSTEM EQUIPMENT SPECIFICATION

### 2.0 ACCEPTABLE MANUFACTURERS

- A. All equipment listed herein will be by DSC to match existing system on campus.
- B. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications and the equipment's technical data sheets.
- C. The functions and features specified are vital to the operation of this facility. Therefore, inclusion of a component's manufacturer in the list of acceptable manufacturers does not release the Contractor from strict compliance with the requirements of this specification.
- D. All basic electronic equipment (not including cable) specified herein shall be produced by a single manufacturer of established reputation and experience who shall have produced similar apparatus for at least three (3) or more years and who shall be able to refer to similar installations rendering satisfactory service.

### 2.1 SYSTEM FUNCTIONS AND CAPABILITIES:

- A. The system shall consist of dual technology motion detection devices connected to detect intrusion into the covered areas. The system shall be zoned per device. Zone numbering shall be provided by the district.
- B. The system shall be capable of interior / perimeter partitioning.
- C. The system shall be capable of master and associate operation.
- D. The system shall be capable, via the District's WAN to a remote computer, of off-site programming and diagnostic functions by the Owner, distributor or manufacturer personnel. It shall be also be possible to facilitate remote software changes. Contractor to provide, install, and program a copy of the Remote Account Manager software to accomplish this task.

### 2.2 PRODUCTS:

- A. Existing DSC MaxSys PC4020 control panel. If existing panel is a maximum capacity, Contractor shall provide additional zone expanders and/or control panels, batteries and power supplies as required to accommodate all devices on the campus. Contractor shall field verify existing system prior to bid.

- B. Motion detectors shall be dual technology (passive infrared (PIR) / Microwave type). Contractor shall field verify and match existing type on campus.
- C. Door contacts: Recessed door contacts. Contractor shall field verify and match existing type on campus.
- D. Power supply for motion detectors. Contractor shall field verify and match existing type on campus. Locate in existing terminal cabinet. Provide new cabinet if there is no space available in the existing terminal cabinet.
- E. Transformer for motion detector power supply. Contractor shall field verify and match existing type on campus.
- F. Back up battery for motion sensor power supply. Contractor shall field verify and match existing type on campus.
- G. Device wiring. Provide device wiring as specified by the manufacturer. Wiring shall be rated for the environment in which it is installed, per CEC and NEC codes.
- H. Protect any roof hatches in the building with magnetic surface mount contacts.

### PART 3 – EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the Contractor shall notify the architect before making any changes. It shall be the responsibility of the factory-authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.
- B. Furnish all conduit, junction boxes, conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.
- C. The cables within the rack or cabinets shall be carefully cabled and secured with Velcro-type fasteners. All cables shall be numbered for identification.
- D. Splices of conductors in underground pull boxes are not permitted.
- E. The labor employed by the Contractor shall be regularly employed in the installation and repair of intrusion alarm/communication systems and shall be acceptable to the Owner and architect to engage in the installation and service of this system.
- F. The Contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc. Daily, the Contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. Daily, the Contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., caused by the performance of this work.
- G. The system must meet all local and other prevailing codes.

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- H. All cabling installations shall be performed by qualified technicians.
- I. All cabling shall be splice free.
- J. Cable lubricant to aid in the installation of cables in conduits, shall be manufactured specifically for communications and security cables. The use of "Yellow 77" lubricant is prohibited. Contractor shall verify the acceptability of any cable lubricant to be used with the cable manufacturer, prior to using such a lubricant.
- K. Plenum rated cable may be run exposed above accessible ceilings, provided the cabling is supported independent of other utilities such as conduits, pipes, and the ceiling support systems. The cables shall not be laid directly on the ceiling panels. Cables shall be independently supported by dedicated j-hooks spaced no further than five (5) feet apart. The use of tie-wraps to secure cables above the ceiling space is prohibited. The cable jacket composition must meet local and all other prevailing fire and safety codes.
- L. All firewalls penetrated by structured cabling shall be sealed by use a non-permanent fire blanket or other method in compliance with the current edition of National Fire Protection Association (NFPA) and the California Electric Code (CEC) or other prevailing code. The Contractor must not use concrete or other non-removable substance for fire stopping on cable trays, wireways or conduits. Contractors who use this method will be required to replace all cables affected and provide the original specified access to each effected area.
- M. All equipment racks shall be bolted to the floor by the Contractor once the Owner determines the exact location for each rack. The earthquake mounting brackets that come with each relay rack kit shall be screwed to studs, not drywall. All equipment shall be serviceable in the racks final location – the need to unbolt racking equipment to access or service equipment is not acceptable. All equipment cabinets shall be screwed to the structural walls with a minimum of four (4) fasteners to the wall studs or plywood backboard, not drywall. The use of drywall screws is prohibited.
- N. Low voltage systems shall be independently suspended. Do not combine low voltage systems cabling on same hangers.

### 3.2 SPECIFIC SYSTEM INSTALLATION REQUIREMENTS

- A. The installer shall, upon completion of the system installation, adjust all controls, etc., to provide a system operating at maximum capability.
- B. Submit block diagram and shop drawings of all equipment associated with system installation in accordance with the submittal requirements of Division 1 and 16.
- C. The system shall be programmed by the District to annunciate, in alpha-numeric format, the device type and device location (in room name format) for all alarm, trouble, service, and faulted conditions.
- D. Zone expanders

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### 3.3 GENERAL TESTING REQUIREMENTS

- A. Provide all instruments for testing and demonstrating in the presence of the Owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds.

### 3.4 SPECIFIC SYSTEM TESTING REQUIREMENTS

- A. System shall detect the entry through a door, switched door and/or the motion of a body taking not more than four steps in an area secured with motion detection equipment where entry doors or windows are possible access. System shall be complete and properly operating prior to calling for the test. The Inspector, Contractor and Engineer shall walk test system at District's option and Contractor shall make minor satisfactory adjustments to the system in the presence of the inspector. Contractor shall coordinate the time of test with the District inspector. This test shall be performed during a time when there is no other persons on the site.
- B. Test equipment: Provide two portable radio transceivers to be used when walk testing the security detection system. The transceivers shall be capable of communication throughout the entire site.

## PART 4 - FINAL ACCEPTANCE

- A. The Owner or Owner's representative may visit the site during the installation of the system to ensure that correct installation practices are being followed.
- B. The Owner or Owner's representative will conduct a final job review once the Contractor has finished the job. This review will take place within one (1) week after the Contractor notifies the Owner.
- C. Two (2) copies of all certification data and drawings for all identifications shall be provided to the Owner before the Owner's review.
- D. The Owner or Owner's representative will review the installation and certification data prior to the system acceptance.
- E. The Owner or Owner's representative may test some of the systems features to ensure that the certification data is correct. If a substantial discrepancy is found, the Owner reserves the right to have an independent consultant perform a certification of the entire system. If such a procedure is undertaken, the cost of the testing will be billed back to the Contractor.
- F. In the event that repairs or adjustments are necessary, the Contractor shall make these repairs at his own expense. All repairs shall be completed within ten (10) days from the time they are discovered.
- G. The Contractor shall provide not less than four (4) hours for site instruction of personnel in the operation and maintenance of the installed systems. This instruction time shall be divided as directed by the Owner.
- H. The Contractor shall hand to the Owner a copy of any applicable installation specific software configurations in disk format.

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END OF SECTION

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